FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 1 of 121

A 64 year old man with a history of poorly controlled hypertension and ischaemic heart disease is brought to ED by ambulance with sudden onset palpitations and shortness of breath. ECG demonstrates atrial fibrillation and your consultant wishes to perform chemical cardioversion. Which of the following drugs would be most suitable for chemical cardioversion in this patient:

a Flecainide

b Amiodarone

c Propafenone

d Digoxin

e Adenosine

Next > | See Answer

Something wrong?

Question Navigator

1 Current Question
2 ...
3 ...
4 ...
5 ...
6 ...
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 1 of 121

A 64 year old man with a history of poorly controlled hypertension and ischaemic heart disease is brought to ED by ambulance with sudden onset palpitations and shortness of breath. ECG demonstrates atrial fibrillation and your consultant wishes to perform chemical cardioversion. Which of the following drugs would be most suitable for chemical cardioversion in this patient:

a) Flecainide
b) **Amiodarone** ✔
c) Propafenone
d) Digoxin
e) Adenosine

Answer

For rhythm-control, chemical cardioversion may be appropriate. Class 1c antiarrhythmic drugs such as flecainide or propafenone may be used but are contraindicated in the presence of heart failure, left ventricular impairment, ischaemic heart disease or prolonged QT-interval. Amiodarone (300 mg intravenously over 20 – 60 mins followed by 900 mg over 24 h) may be used to attempt chemical cardioversion but is less often effective and takes longer to act. Electrical cardioversion remains an option in this setting and will restore sinus rhythm in more patients than chemical cardioversion.

Notes

Treatment of patients with atrial fibrillation aims to reduce symptoms and prevent complications, especially stroke. Atrial fibrillation may be managed by either controlling the ventricular rate (rate control) or by attempting to restore and maintain sinus rhythm (rhythm control).

New-onset atrial fibrillation

All patients with adverse features suggesting life-threatening haemodynamic instability (shock, syncope, heart failure, myocardial ischaemia) caused by new onset atrial fibrillation should undergo emergency electrical cardioversion with synchronised DC shock without delaying to achieve anticoagulation.

In patients presenting acutely (< 48 hrs) with new onset AF but without adverse features, immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation).

- For rate-control, the usual drug of choice is a beta-blocker. Diltiazem may be used in patients in whom beta-blockade is contraindicated or not tolerated. Digoxin may be used in patients with heart failure. Amiodarone may be used to assist with rate control but is most useful in maintaining rhythm control.
- For rhythm-control, chemical cardioversion may be appropriate. Class 1c antiarrhythmic drugs such as flecainide or propafenone may be used but are contraindicated in the presence of heart failure, left ventricular impairment, ischaemic heart disease or prolonged QT-interval. Amiodarone (300 mg intravenously over 20 – 60 mins followed by 900 mg over 24 h) may be used to attempt chemical cardioversion but is less often effective and takes longer to act.
- Electrical cardioversion remains an option in this setting and will restore sinus rhythm in more patients than chemical cardioversion.

The longer a person remains in AF, the greater is the likelihood of atrial thrombus developing. In general, people who have been in AF for > 48 h should not be treated by cardioversion (electrical or chemical) until they have been fully anticoagulated for at least 3 weeks, or unless transoesophageal echocardiography has detected no evidence of atrial thrombus.

Long-term management

In general, rate control is the preferred first line drug treatment strategy for atrial fibrillation in most patients except in patients with:

- new onset atrial fibrillation
- heart failure secondary to atrial fibrillation
- atrial flutter suitable for an ablation strategy
- atrial fibrillation with a reversible cause
- or if rhythm control is more suitable based on clinical judgement.

Rate control may be achieved with a beta-blocker or a rate limiting non-dihydropyridine calcium channel blocker e.g. verapamil or diltiazem.

Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation or in combination therapy in resistant cases. Digoxin is also used when atrial fibrillation is accompanied by congestive heart failure.

If symptoms are not controlled with a combination of two drugs, a rhythm-control strategy should be considered.

All patients with AF should be assessed and managed for risk of stroke and thromboembolism, and risk of bleeding if anticoagulation is being considered.

Next >

Something wrong?

Question Navigator

Pharmacology: Cardiovascular

Question 2 of 121

Thiazide diuretics act primarily at which of the following sites in the nephron:

a Proximal tubule

b Ascending limb

c Collecting ducts

d Early distal tubule

e Descending limb

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Current Question
3 ...
4 ...
5 ...
6 ...
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 2 of 121

Thiazide diuretics act primarily at which of the following sites in the nephron:

a) **Proximal tubule** ✗
b) Ascending limb
c) Collecting ducts
d) Early distal tubule ✓
e) Descending limb

Answer

Thiazides act mainly on the early segments of distal tubule where they inhibit NaCl reabsorption by binding to the the Na+/Cl- cotransporter. Excretion of Cl-, Na+ and accompanying water is increased. The increased Na+ load in the distal tubule stimulates Na+ exchange with K+ and H+, increasing their excretion and causing hypokalaemia and a metabolic alkalosis. Excretion of Ca2+ is reduced.

Notes

Thiazide diuretics are moderately potent diuretics, and are used to relieve oedema in chronic heart failure, and in the management of hypertension. They act within 1 to 2 hours of oral administration and most have a duration of action of 12 to 24 hours.

Mechanism of action

Thiazides act mainly on the early segments of distal tubule where they inhibit NaCl reabsorption by binding to the the Na+/Cl- cotransporter. Excretion of Cl-, Na+ and accompanying water is increased. The increased Na+ load in the distal tubule stimulates Na+ exchange with K+ and H+, increasing their excretion and causing hypokalaemia and a metabolic alkalosis. Excretion of Ca2+ is reduced.

Indications

Bendroflumethiazide is used for oedema in mild or moderate heart failure. Combination diuretic therapy (with loop and thiazide diuretics) may be effective in patients with oedema resistant to treatment with one diuretic.

Thiazide diuretics are licensed for the treatment of hypertension but are no longer considered the first line diuretic for this indication. In the management of hypertension a low dose of a thiazide produces a maximal or near-maximal blood pressure lowering effect, with very little biochemical disturbance. Higher doses cause more marked changes in plasma potassium, sodium, uric acid, glucose, and lipids, with little advantage in blood pressure control.

Contraindications

Thiazide diuretics are contraindicated in:

- Addison's disease
- Hypercalcaemia
- Hyponatraemia
- Refractory hypokalaemia
- Symptomatic hyperuricaemia
- Severe hepatic impairment (may precipitate encephalopathy)

Cautions

Thiazide diuretics should be used with caution in:

- Diabetes mellitus (may exacerbate)
- Gout (may exacerbate)
- Systemic lupus erythematosus (may exacerbate)
- Hyperaldosteronism
- Malnourishment
- Nephrotic syndrome

Adverse effects

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects. The dose should then be adjusted according to renal function.

Common side effects of thiazide diuretics include:

- Excessive diuresis
  - Postural hypotension, dehydration, renal impairment
- Acid-base and electrolyte imbalance
  - Hypokalaemia, hyponatraemia, hypomagnesaemia, hypercalcaemia, hypochloraemic alkalosis
- Metabolic imbalance
  - Hyperuricaemia and gout
  - Impaired glucose tolerance and hyperglycaemia
  - Altered plasma-lipid concentrations
- Mild gastrointestinal disturbances

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic. Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Current Question
3 ...
4 ...
5 ...
6 ...
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 3 of 121

What is the recommended dosing regime for amiodarone in the treatment of a stable regular broad-complex tachycardia:

a 150 mg IV bolus, followed by an IV infusion of 300 mg over next 20 – 60 minutes

b 300 mg IV over 20 – 60 minutes, followed by an IV infusion of 900 mg over the next 24 hours

c 300 mg IV over 20 – 60 minutes, followed by further 300 mg IV infusion over 20 – 60 minutes if no response

d 300 mg IV over 10 – 20 minutes, followed by an IV infusion of 900 mg over the next 24 hours

e 150 mg IV bolus, followed by two further 300 mg IV boluses if no response

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Current Question
4 ...
5 ...
6 ...
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 3 of 121

What is the recommended dosing regime for amiodarone in the treatment of a stable regular broad-complex tachycardia:

a) 150 mg IV bolus, followed by an IV infusion of 300 mg over next 20 – 60 minutes

b) ✔

300 mg IV over 20 – 60 minutes, followed by an IV infusion of 900 mg over the next 24 hours

c)

300 mg IV over 20 – 60 minutes, followed by further 300 mg IV infusion over 20 – 60 minutes if no response

d) 300 mg IV over 10 – 20 minutes, followed by an IV infusion of 900 mg over the next 24 hours

e) 150 mg IV bolus, followed by two further 300 mg IV boluses if no response

Answer

A ventricular tachycardia (or broad-complex tachycardia of uncertain origin) should be treated with amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours.

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Current Question
4 ...
5 ...
6 ...
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 4 of 121

Captopril is contraindicated in which of the following:

a Prostatic hypertrophy

b Renal artery stenosis

c Heart failure

d Asthma

e Second degree heart block

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Current Question
5 ...
6 ...
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 4 of 121

Captopril is contraindicated in which of the following:

a) Prostatic hypertrophy
b) Renal artery stenosis ✔
c) Heart failure
d) **Asthma** ✘
e) Second degree heart block

Answer

In patients with severe bilateral renal artery stenosis (or severe stenosis of the artery supplying a single functioning kidney), ACE inhibitors reduce or abolish glomerular filtration and are likely to cause severe and progressive renal failure. ACE inhibitors are best avoided in patients with known or suspected renovascular disease, unless the blood pressure cannot be controlled by other drugs. If ACE inhibitors are used, they should be initiated only under specialist supervision and renal function should be monitored regularly. ACE inhibitors should also be used with particular caution in patients who may have undiagnosed and clinically silent renovascular disease. This includes patients with peripheral vascular disease or those with severe generalised atherosclerosis.

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Current Question
5 ...
6 ...
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 5 of 121

Which of the following drugs is first line treatment for a stable regular narrow-complex tachycardia:

a Amiodarone

b Adrenaline

c Adenosine

d Atropine

e Flecainide

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Current Question
6 ...
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 5 of 121

Which of the following drugs is first line treatment for a stable regular narrow-complex tachycardia:

a) Amiodarone
b) Adrenaline
c) **Adenosine** ✔
d) Atropine
e) Flecainide

Answer

The first step in treatment of regular narrow-complex tachycardias is to attempt vagal manoeuvres (carotid sinus massage or Valsalva manoeuvre). If the tachyarrhythmia persists, adenosine 6 mg IV should be given as a rapid bolus using a large cannula and a large vein. If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg).

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Current Question
6 ...
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 6 of 121

An 80 year old man requires treatment with an antibiotic. He takes warfarin for atrial fibrillation. What antibiotic is the safest choice for this patient:

a Ciprofloxacin

b Co-trimodazole

c Clarithromycin

d Doxycycline

e Cephalexin

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Current Question
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 6 of 121

An 80 year old man requires treatment with an antibiotic. He takes warfarin for atrial fibrillation. What antibiotic is the safest choice for this patient:

a) Ciprofloxacin
b) **Co-trimodazole** ✖
c) Clarithromycin
d) Doxycycline
e) Cephalexin ✔

Answer

Alterations in INR are common among patients who receive antibiotics, especially those prescribed antibiotics at high risk of interacting with warfarin. Cephalexin and clindamycin, which have minimal interactions with warfarin, are considered low-risk antibiotics.

Antibiotics at high risk of interacting with warfarin, and enhancing its anticoagulant effects include:

- Azithromycin
- Quinolones e.g. ciprofloxacin, levofloxacin
- Macrolides e.g. clarithromycin, erythromycin
- Metronidazole
- Sulfonamides e.g. co-trimoxazole
- Trimethoprim
- Tetracyclines e.g. doxycycline

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Warfarin is a vitamin K antagonist and will reduce the activity of vitamin-K dependent clotting factors (factors VII, IX, X and II) and of protein C and S.

Both the PT and APTT are usually prolonged but the PT is grossly prolonged and the APTT only mildly.

Indications

Warfarin is licensed for:

- Prophylaxis of systemic embolism in people with rheumatic heart disease and atrial fibrillation
- Prophylaxis after insertion of prosthetic heart valves
- Prophylaxis and treatment of venous thrombosis and pulmonary embolism
- Transient attacks of cerebral ischaemia

Warfarin takes at least 48 to 72 hours for the anticoagulant effect to develop and if an immediate effect is required, heparin must be given concomitantly and continued for at least 5 days and until the INR is greater or equal to 2.0 for more than 24 hours. The duration of treatment is dependent on the indication.

Contraindications

- Haemorrhagic stroke
- Clinically significant bleeding
- Within 72 hours of major surgery with risk of severe bleeding
- Within 48 hours postpartum
- Pregnancy
- Untreated bleeding disorders for example, thrombocytopenia, haemophilia, liver failure and renal failure
- Potential bleeding lesions for example; active peptic ulcer; oesophageal varices; aneurysm; proliferative retinopathy; recent organ biopsy; recent trauma or surgery to head, orbit, or spine; recent stroke; confirmed intracranial or intraspinal bleed

Cautions

Warfarin should be used with caution in any patient at increased risk of haemorrhage with risk factors including:

- People aged over 65 years
- Previous bleeding episode, history of gastrointestinal bleeding or anaemia
- Recent ischaemic stroke, hypertension, heart disease, cerebrovascular disease, renal disease, liver disease, active peptic ulcer
- Recent or imminent surgery or trauma
- Excessive alcohol intake, frequent or significant falls
- Regular use of NSAIDs or other drugs that increase risk of bleeding

Adverse effects

- The most common adverse effect of warfarin is bleeding
- Other common adverse effects of warfarin include nausea, vomiting, diarrhoea, jaundice, hepatic dysfunction, pancreatitis, pyrexia, alopecia, purpura, and rash
- Skin necrosis is a rare but serious adverse effect of warfarin; treatment with warfarin should be stopped if warfarin related skin necrosis is suspected
- Calciphylaxis is a rare, but a very serious condition that causes vascular calcification and cutaneous necrosis

Monitoring

The prothrombin time, reported as the INR is used to monitor warfarin therapy; the target INR is dependent on the indication.

Warfarin may need to be omitted for a couple of doses if the INR rises above the target range or even reversed if the INR is > 8.0 or there are signs of bleeding. Phytomenadione (vitamin K) can be given as a specific antidote to warfarin or in cases of major bleeding, dried prothrombin complex (factors II, VII, IX, and X); if dried prothrombin complex is unavailable, fresh frozen plasma can be given but is less effective.

Scenario	Management
INR 5.0 – 8.0, no bleeding	Withhold 1 – 2 doses of warfarin and reduce subsequent maintenance dose
INR 5.0 – 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, restart warfarin when INR < 5.0
INR > 8.0, no bleeding	Stop warfarin, give phytomenadione orally, restart warfarin when INR < 5.0
INR > 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, repeat dose if INR still too high after 24 h, restart warfarin when INR < 5.0
Major bleeding	Stop warfarin, give phytomenadione intravenously, give dried prothrombin complex

Drug interactions

Increased anticoagulant effect	Decreased anticoagulant effect
Alcohol	Tricyclic antidepressants
Amiodarone	St John's wort
Antibiotics(co-trimoxazole, metronidazole, quinolones, macrolides)	Vitamin K-containing vitamin complexes, some enteral feeds, mineral supplements, and green vegetables
Antidepressants (SSRIs, SNRIs, TCAs)	Rifampicin
Azoles	Carbamazepine
Cranberry juice	Phenobarbital
Corticosteroids	Primidone
Fibrates	Azathioprine
NSAIDs	Phenytoin
Thyroxine	Griseofulvin

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Current Question
7 ...
8 ...
9 ...
10 ...
11 ...
12 ...

< Previous | Next >

Something wrong?

Pharmacology: Cardiovascular

Question 7 of 121

What is the main mechanism of action of dopamine as an inotropic sympathomimetic:

a Dopamine receptor agonist

b Beta1-receptor agonist

c Beta2-receptor agonist

d Alpha1-receptor agonist

e Alpha2-receptor agonist

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Current Question
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 7 of 121

What is the main mechanism of action of dopamine as an inotropic sympathomimetic:

a) Dopamine receptor agonist
b) **Beta1-receptor agonist** ✔
c) Beta2-receptor agonist
d) Alpha1-receptor agonist
e) Alpha2-receptor agonist

Answer

Dopamine is a neurotransmitter and a metabolic precursor of the catecholamines. It acts on beta1-receptors in cardiac muscle increasing cardiac contractility, and increases renal perfusion by stimulating dopamine receptors in the renal vasculature. This is of benefit in cardiogenic shock where deterioration of renal function is common.

Notes

Shock is a medical emergency associated with a high mortality. The underlying causes of shock such as haemorrhage, sepsis, or myocardial insufficiency should be corrected. The profound hypotension of shock must be treated promptly to prevent tissue hypoxia and organ failure. Volume replacement is essential to correct the hypovolaemia associated with haemorrhage and sepsis but may be detrimental in cardiogenic shock.

Inotropic sympathomimetics

Depending on haemodynamic status, cardiac output may be improved by the use of sympathomimetic inotropes such as adrenaline/epinephrine, dobutamine or dopamine.

In septic shock, when fluid replacement and inotropic support fail to maintain blood pressure, the vasoconstrictor noradrenaline/norepinephrine may be considered. In cardiogenic shock peripheral resistance is frequently high and to raise it further may worsen myocardial performance and exacerbate tissue ischaemia.

- Dobutamine directly stimulates the beta1-adrenergic receptors in the heart and increases contractility and cardiac output with little effect on the rate. In addition action on beta2-receptors causes vasodilation.
- Dopamine is a neurotransmitter and a metabolic precursor of the catecholamines. It acts on beta1-receptors in cardiac muscle increasing cardiac contractility, and increases renal perfusion by stimulating dopamine receptors in the renal vasculature. This is of benefit in cardiogenic shock where deterioration of renal function is common.
- Epinephrine increases blood pressure by stimulating the rate and force of the heartbeat (beta1-effects). Stimulation of vascular alpha-receptors causes vasoconstriction (viscera, skin) but beta-2 receptor stimulation causes vasodilation (skeletal muscle) and the total peripheral resistance may actually decrease.
- Norepinephrine has little or no effect on the vascular beta2-receptors, and so the alpha-mediated vasoconstriction is unopposed. The resulting rise in blood pressure reflexively slows the heart.

The use of sympathomimetic inotropes and vasoconstrictors should preferably be confined to the intensive care setting and undertaken with invasive haemodynamic monitoring.

Vasoconstrictor sympathomimetics

Vasoconstrictor sympathomimetics, such as ephedrine and metaraminol, raise blood pressure transiently by acting on alpha-adrenergic receptors to constrict peripheral vessels. They are sometimes used as an emergency method of elevating blood pressure where other measures have failed. Their use is limited as although they raise the blood pressure they also reduce organ perfusion.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Current Question
8 ...
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 8 of 121

In adult basic life support, chest compressions should be performed at which of the following rates:

a 60 – 80 per minute

b 60 – 70 per minute

c 90 – 100 per minute

d 80 – 100 per minute

e 100 – 120 per minute

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Current Question
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 8 of 121

In adult basic life support, chest compressions should be performed at which of the following rates:

a) 60 – 80 per minute
b) 60 – 70 per minute
c) 90 – 100 per minute
d) 80 – 100 per minute
e) **100 – 120 per minute** ✔

Answer

Chest compressions should be performed at a rate of 100 – 120 per minute.

Notes

Basic life support

- For chest compressions in adult basic life support the heel of one hand should be placed over the middle of the lower half of the patient's sternum with the other hand on top.
- The sternum should be depressed to a depth of 5 – 6 cm.
- Chest compressions should be performed at a rate of 100 – 120 per minute.
- Thirty compressions should be given before two breaths and that ratio continued (30:2).
- The person giving CPR should be changed every 2 minutes if possible to avoid exhaustion and poor quality chest compressions.
- Interruptions should be minimised (pauses should be < 5 seconds).

Advanced life support

- In adult advanced life support, basic life support should continue whilst the defibrillator pads are attached and the airway managed.
- The pads should be positioned one to the right of the upper sternum below the clavicle and the other in the left midaxillary line in the 5th intercostal space.
- Chest compressions should be paused briefly (< 5 secs) to assess the rhythm and then continued as the defibrillator charges if a shockable rhythm is identified or continued for a further two whole minutes if a non-shockable rhythm is identified.
- When delivering a shock, everybody should be clear of the patient (and any GTN patches and oxygen sources removed).
- Once the shock has been delivered, compressions should resume immediately and continue for a further two minutes before checking the rhythm again or feeling for a pulse.

Shockable rhythm (ventricular fibrillation or pulseless ventricular tachycardia)

- IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter.
- IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Non-shockable rhythm (asystole or pulseless electrical activity)

- IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Current Question
9 ...
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 9 of 121

What is the most common side effect of verapamil:

a Postural hypotension

b Constipation

c Ankle swelling

d Bronchospasm

e Hyperkalaemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Current Question
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 9 of 121

What is the most common side effect of verapamil:

a) Postural hypotension ✖
b) Constipation ✔
c) Ankle swelling
d) Bronchospasm
e) Hyperkalaemia

Answer

Verapamil is used for the treatment of angina, hypertension, and arrhythmias. Verapamil is highly negatively inotropic and reduces cardiac output, slows the heart rate and may impair atrioventricular conduction. It may precipitate heart failure, exacerbate conduction disorders, and cause hypotension at high doses and should not be used with beta-blockers. Constipation is the most common side effect.

Notes

Calcium channel blockers are widely used in the treatment of angina (second line to beta-blockers) and also for hypertension, heart failure and arrhythmias.

Calcium channel blockers vary widely in their predilection for the various possible sites of action and in their therapeutic effects and may be divided into the dihydropyridine type (e.g. amlodipine, nifedipine and nimodipine) and the rate-limiting non-dihydropyridine type (e.g. verapamil, diltiazem).

Mechanism of action

Calcium channel blockers inhibit L-type voltage-sensitive calcium channels in arterial smooth muscle, causing relaxation and vasodilation. They also block calcium channels within the myocardium and conducting tissues of the heart which produces a negative inotropic effect by reducing calcium influx during the plateau phase of the action potential.

The dihydropyridines have relatively little effect on the heart because they have a much higher affinity for inactivated channels found more frequently in vascular muscle. Furthermore, at clinical doses, vasodilation results in a reflex increase in sympathetic tone that counteracts the mild negative inotropic effect. The non-dihydropyridines are rate-limiting calcium-channel blockers that depress the sinus node and slow conduction in the atrioventricular node, causing a mild resting bradycardia.

Contraindications

Non-dihydropyridine CCBs:

- Atrial flutter or fibrillation
- Heart failure or history of heart failure (may precipitate or aggravate symptoms)
- Cardiac outflow obstruction e.g. significant aortic stenosis or obstructive hypertrophic cardiomyopathy (vasodilation may result in reduced cardiac output)
- Second or third degree AV block (may induce complete AV block)
- Severe bradycardia
- Sick sinus syndrome

Dihydropyridine CCBs:

- Uncontrolled heart failure
- Severe hypotension
- Cardiac outflow obstruction

Adverse effects

- Gastrointestinal adverse effects – constipation, nausea, dyspepsia
- Bradycardia, AV block, reflex tachycardia, palpitations
- Vasodilatory adverse effects – flushing, dizziness, headache, postural hypotension, ankle swelling (more common with dihydropyridine calcium-channel blockers and often improve with continued use, although ankle swelling often persists)
- Gingival hyperplasia
- Malaise and fatigue
- Myalgia and arthralgia

Verapamil

Verapamil is used for the treatment of angina, hypertension, and arrhythmias. Verapamil is highly negatively inotropic and reduces cardiac output, slows the heart rate and may impair atrioventricular conduction. It may precipitate heart failure, exacerbate conduction disorders, and cause hypotension at high doses and should not be used with beta-blockers. Constipation is the most common side effect.

Nifedipine

Nifedipine relaxes vascular smooth muscle and dilates coronary and peripheral arteries. Nifedipine has less myocardial effects than verapamil and has no antiarrhythmic properties but has more influence on the vessels. Unlike verapamil it rarely precipitates heart failure because any negative inotropic effect is offset by a reduction in left ventricular work.

Nimodipine

Nimodipine is related to nifedipine but the smooth muscle relaxant effects preferentially act on cerebral arteries. It is used solely for the prevention and treatment of vascular spasm following aneurysmal subarachnoid haemorrhage.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Current Question
10 ...
11 ...
12 ...

Pharmacology: Cardiovascular

Question 10 of 121

What is the maximum recommended dose of atropine that may be given in the treatment of bradyarrhythmias associated with adverse features or a risk of asystole:

a 3 g

b 300 mcg

c 3 mg

d 30 mg

e 0.3 mg

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Current Question
11 ...
12 ...

Pharmacology: Cardiovascular

Question 10 of 121

What is the maximum recommended dose of atropine that may be given in the treatment of bradyarrhythmias associated with adverse features or a risk of asystole:

a) 3 g ✗
b) 300 mcg
c) 3 mg ✓
d) 30 mg
e) 0.3 mg

Answer

If there are adverse features or a risk of asystole, atropine 500 mcg IV bolus should be given. If there is an unsatisfactory response, this can be repeated every 3 – 5 mins up to a maximum dose of 3 mg. Atropine should be used cautiously in the presence of acute myocardial ischaemia or myocardial infarction as the resulting increase in heart rate may worsen ischaemia or increase the size of the infarct.

Notes

The approach to the management of bradyarrhythmias should follow the Resuscitation Council guidelines.

If there are no adverse features (shock, syncope, myocardial ischaemia or heart failure) and no risk of asystole (recent asystole, Mobitz II AV block, complete heart block with broad QRS, ventricular pause > 3 seconds), immediate treatment can be delayed and the patient assessed to try and identify the cause of the bradycardia.

If there are adverse features or a risk of asystole, atropine 500 mcg IV bolus should be given. If there is an unsatisfactory response, this can be repeated every 3 – 5 mins up to a maximum dose of 3 mg. Atropine should be used cautiously in the presence of acute myocardial ischaemia or myocardial infarction as the resulting increase in heart rate may worsen ischaemia or increase the size of the infarct.

Other interim measures may include other drugs such as isoprenaline or adrenaline (or alternately aminophylline, dopamine, glucagon (if beta-blocker or calcium channel blocker overdose) or glycopyrrolate). For a patient with bradycardia and adverse features, if there is no response to atropine, or if atropine is contraindicated, transcutaneous pacing should be initiated immediately. In the presence of life-threatening, extreme bradycardia, percussion pacing should be used as an interim measure until transcutaneous pacing is achieved.

Expert help should be sought and ultimately transvenous pacing arranged.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Current Question
11 ...
12 ...

Pharmacology: Cardiovascular

Question 11 of 121

Which of the following drugs is first line treatment for a stable regular broad-complex tachycardia:

a Amiodarone

b Adrenaline

c Adenosine

d Atropine

e Flecainide

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Current Question
12 ...

Pharmacology: Cardiovascular

Question 11 of 121

Which of the following drugs is first line treatment for a stable regular broad-complex tachycardia:

a) **Amiodarone** ✔
b) Adrenaline
c) Adenosine
d) Atropine
e) Flecainide

Answer

A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block. A ventricular tachycardia (or broad-complex tachycardia of uncertain origin) should be treated with amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours. If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Current Question
12 ...

Pharmacology: Cardiovascular

Question 12 of 121

What is the main mechanism of action of enoxaparin:

a Inhibits vitamin K dependent clotting factors

b Inhibits factor Xa

c Potentiate effects of antithrombin

d Directly inhibits thrombin

e Blocks GPIIb/IIIa receptor sites

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Current Question

Pharmacology: Cardiovascular

Question 12 of 121

What is the main mechanism of action of enoxaparin:

a) Inhibits vitamin K dependent clotting factors
b) Inhibits factor Xa ✔
c) Potentiate effects of antithrombin
d) Directly inhibits thrombin
e) **Blocks GPIIb/IIIa receptor sites** ✖

Answer

Heparin potentiates the activity of antithrombin III, causing inactivation of thrombin. The heparin-antithrombin III complex also inhibits factor Xa and some other factors. Low molecular weight heparin (LMWH) preparations inhibit only factor Xa.

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Heparin potentiates the activity of antithrombin III, causing inactivation of thrombin. The heparin-antithrombin III complex also inhibits factor Xa and some other factors. Low molecular weight heparin (LMWH) preparations inhibit only factor Xa. PT and APTT may both be prolonged but the PT less so.

Contraindications

Heparins are contraindicated:

- In people with current (or history of) heparin-induced thrombocytopenia
- In people with acute bacterial endocarditis
- In people with active major bleeding, and conditions with a high risk of uncontrolled bleeding, including recent haemorrhagic stroke, major trauma, recent brain, spinal cord or eye surgery, haemophilia and thrombocytopenia
- In people with active gastric or duodenal ulceration

Adverse effects

- Bleeding
- Heparin-induced thrombocytopenia (immune-mediated effect that usually develops after 5 – 10 days, signs may include a 30% reduction of platelet count, thrombosis, or skin allergy; if HIT is suspected or confirmed, heparin should be discontinued and an alternative anticoagulant given)
- Hyperkalaemia (due to inhibition of aldosterone secretion; patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium or those taking potassium-sparing drugs seem to be more susceptible)
- Osteoporosis (risk lower with LMWH)
- Alopecia
- Hypersensitivity reactions
- Injection site reactions

Low molecular weight heparin vs unfractionated heparin

Unfractionated heparin is usually given by continuous intravenous infusion for the smoothest control and is the treatment of choice where rapid reversal of anticoagulation may be required (e.g. in surgical patients or late pregnancy). Therapy is monitored by maintaining the APTT at 1.5 – 2.5 times the upper limit of normal.

Low molecular weight heparin (LMWH) preparations have largely replaced unfractionated heparin.

Advantages of LMWH
Greater ability to inhibit factor Xa directly, interacting less with platelets and so may have a lesser tendency to cause bleeding
Greater bioavailability and longer half-life in plasma making once daily subcutaneous administration possible
More predictable dose response avoiding the need for routine anticoagulant monitoring
Lower associated risk of heparin-induced thrombocytopenia or of osteoporosis

Haemorrhage

Because it has a short duration of action, if haemorrhage occurs it is usually sufficient to withdraw unfractionated or low molecular weight heparin, but if rapid reversal of the effects of the heparin is required, protamine sulfate is a specific antidote (but only partially reverses the effects of low molecular weight heparins).

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Current Question

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 13 of 121

What is the initial recommended dose for atropine in the treatment of bradyarrhythmias associated with adverse features or a risk of asystole:

a 400 micrograms

b 500 micrograms

c 1 mg

d 5 mg

e 6 mg

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 13 of 121

What is the initial recommended dose for atropine in the treatment of bradyarrhythmias associated with adverse features or a risk of asystole:

a) 400 micrograms
b) **500 micrograms** ✔
c) 1 mg
d) 5 mg
e) 6 mg

Answer

If there are adverse features or a risk of asystole, atropine 500 mcg IV bolus should be given. If there is an unsatisfactory response, this can be repeated every 3 – 5 mins up to a maximum dose of 3 mg. Atropine should be used cautiously in the presence of acute myocardial ischaemia or myocardial infarction as the resulting increase in heart rate may worsen ischaemia or increase the size of the infarct.

Notes

The approach to the management of bradyarrhythmias should follow the Resuscitation Council guidelines.

If there are no adverse features (shock, syncope, myocardial ischaemia or heart failure) and no risk of asystole (recent asystole, Mobitz II AV block, complete heart block with broad QRS, ventricular pause > 3 seconds), immediate treatment can be delayed and the patient assessed to try and identify the cause of the bradycardia.

If there are adverse features or a risk of asystole, atropine 500 mcg IV bolus should be given. If there is an unsatisfactory response, this can be repeated every 3 – 5 mins up to a maximum dose of 3 mg. Atropine should be used cautiously in the presence of acute myocardial ischaemia or myocardial infarction as the resulting increase in heart rate may worsen ischaemia or increase the size of the infarct.

Other interim measures may include other drugs such as isoprenaline or adrenaline (or alternately aminophylline, dopamine, glucagon (if beta-blocker or calcium channel blocker overdose) or glycopyrrolate). For a patient with bradycardia and adverse features, if there is no response to atropine, or if atropine is contraindicated, transcutaneous pacing should be initiated immediately. In the presence of life-threatening, extreme bradycardia, percussion pacing should be used as an interim measure until transcutaneous pacing is achieved.

Expert help should be sought and ultimately transvenous pacing arranged.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 14 of 121

A 67-year-old man is being treated for atrial fibrillation with digoxin. If his serum digoxin levels are above the therapeutic range, he is at highest risk for developing digoxin toxicity if he also develops:

a Hyponatraemia

b Vitamin B12 deficiency

c Hypokalaemia

d Hypocalcaemia

e Hypophosphataemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 14 of 121

A 67-year-old man is being treated for atrial fibrillation with digoxin. If his serum digoxin levels are above the therapeutic range, he is at highest risk for developing digoxin toxicity if he also develops:

a) Hyponatraemia
b) Vitamin B12 deficiency
c) **Hypokalaemia** ✔
d) Hypocalcaemia
e) Hypophosphataemia

Answer

Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Care should also be taken in the elderly who are particularly susceptible to digoxin toxicity. Hypokalaemia may be precipitated by use of diuretics.

Notes

Digoxin is a cardiac glycoside that increases the force of myocardial contraction (positive inotrope), and slows the heart rate (negative chronotrope). Digoxin has a narrow therapeutic index; digoxin toxicity can occur even when the serum digoxin concentration is within the therapeutic range (between 0.7 – 2.0 mcg/L).

Mechanism of action

Inotropic effect:

Digoxin directly inhibits membrane Na+/K+ ATPase, which is responsible for Na+/K+ exchange across the myocyte cell membrane. This increases intracellular Na+ and produces a secondary increase in intracellular Ca2+ that increases the force of myocardial contraction. The increase in intracellular Ca2+ occurs because the decreased Na+ gradient across the membrane reduces the extrusion of Ca2+ by the Na+/Ca2+ exchanger that normally occurs during diastole. Digoxin and K+ ions compete for the receptor on the outside of the muscle cell membrane, and so the effects of digoxin may be dangerously increased in hypokalaemia.

Chronotropic effect:

Digoxin stimulates vagal activity , causing the release of ACh, which slows the heart rate, slows atrioventricular conduction and prolongs the refractory period in the AVN and bundle of His. By delaying AV conduction, digoxin increases the degree of block, and slows and strengthens the ventricular beat.

Indications

Digoxin is most useful for controlling the ventricular response in persistent and permanent atrial fibrillation and atrial flutter. Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation. It is now rarely used for rapid control of heart rate, as even with intravenous administration, response may take many hours.

Digoxin also has a role in the management of heart failure; digoxin improves symptoms of heart failure and exercise tolerance and reduces hospitalisation due to acute exacerbations but it does not reduce mortality. Digoxin is reserved for patients with worsening or severe heart failure due to left ventricular systolic dysfunction refractory to combination therapy with first-line agents.

Contraindications

Digoxin is contraindicated in:

- Supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome
- Ventricular tachycardia or fibrillation
- Heart conduction problems e.g. second degree or intermittent complete heart block
- Hypertrophic cardiomyopathy (unless concomitant atrial fibrillation and heart failure but should be used with caution)

Cautions

Digoxin should be used with caution in:

- Hypercalcaemia (risk of digitalis toxicity)
- Hypokalaemia (risk of digitalis toxicity; diuretics may predispose to hypokalaemia)
- Hypomagnesaemia (risk of digitalis toxicity)
- Hypoxia (risk of digitalis toxicity)
- Recent myocardial infarction
- Severe respiratory disease
- Sick sinus syndrome
- Thyroid disease
- Constrictive pericarditis
- Renal impairment (reduce dose and monitor plasma-digoxin concentration; toxicity increased by electrolyte disturbances)
- Elderly people (reduce dose)
- Concomitant drug therapy with drugs which may increase plasma concentration of digoxin e.g. amiodarone, antimicrobials, calcium-channel blockers, spironolactone

Adverse effects

The adverse effects of digoxin are frequently due to its narrow therapeutic window and include:

- Cardiac adverse effects
  - Sinoatrial and atrioventricular block
  - Premature ventricular contractions
  - PR prolongation and ST-segment depression
- Nausea, vomiting and diarrhoea
- Blurred or yellow vision
- CNS effects
  - weakness, dizziness, confusion, apathy, malaise, headache, depression, psychosis
- Thrombocytopenia and agranulocytosis (rare)
- Gynaecomastia in men in prolonged administration

Digoxin toxicity

Unwanted effects of digoxin depend on both the plasma concentration of digoxin (increasing risk of toxicity through the range 1.5 – 3 mcg/L) and on the sensitivity of the conducting system or of the myocardium, which is often increased in heart disease. Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Care should also be taken in the elderly who are particularly susceptible to digoxin toxicity.

If toxicity occurs, digoxin should be withdrawn. Digoxin-specific antibody fragments are indicated for the treatment of known or strongly suspected life-threatening digoxin toxicity associated with ventricular arrhythmias or bradyarrhythmias unresponsive to atropine sulfate and when measures beyond the withdrawal of digoxin and correction of any electrolyte abnormalities are considered necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 15 of 121

Digoxin is contraindicated in all of the following EXCEPT for:

a Ventricular tachycardia

b Hypertrophic cardiomyopathy

c Intermittent complete heart block

d Asthma

e Wolff-Parkinson-White syndrome

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 15 of 121

Digoxin is contraindicated in all of the following EXCEPT for:

a) Ventricular tachycardia
b) Hypertrophic cardiomyopathy
c) Intermittent complete heart block
d) **Asthma** ✔
e) Wolff-Parkinson-White syndrome

Answer

Digoxin is contraindicated in:

- Supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome
- Ventricular tachycardia or fibrillation
- Heart conduction problems e.g. second degree or intermittent complete heart block
- Hypertrophic cardiomyopathy (unless concomitant atrial fibrillation and heart failure but should be used with caution)

Notes

Digoxin is a cardiac glycoside that increases the force of myocardial contraction (positive inotrope), and slows the heart rate (negative chronotrope). Digoxin has a narrow therapeutic index; digoxin toxicity can occur even when the serum digoxin concentration is within the therapeutic range (between 0.7 – 2.0 mcg/L).

Mechanism of action

Inotropic effect:

Digoxin inhibits membrane Na+/K+ ATPase, which is responsible for Na+/K+ exchange across the myocyte cell membrane. This increases intracellular Na+ and produces a secondary increase in intracellular Ca2+ that increases the force of myocardial contraction. The increase in intracellular Ca2+ occurs because the decreased Na+ gradient across the membrane reduces the extrusion of Ca2+ by the Na+/Ca2+ exchanger that normally occurs during diastole. Digoxin and K+ ions compete for the receptor on the outside of the muscle cell membrane, and so the effects of digoxin may be dangerously increased in hypokalaemia.

Chronotropic effect:

Digoxin stimulates vagal activity , causing the release of ACh, which slows the heart rate, slows atrioventricular conduction and prolongs the refractory period in the AVN and bundle of His. By delaying AV conduction, digoxin increases the degree of block, and slows and strengthens the ventricular beat.

Indications

Digoxin is most useful for controlling the ventricular response in persistent and permanent atrial fibrillation and atrial flutter. Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation. It is now rarely used for rapid control of heart rate, as even with intravenous administration, response may take many hours.

Digoxin also has a role in the management of heart failure; digoxin improves symptoms of heart failure and exercise tolerance and reduces hospitalisation due to acute exacerbations but it does not reduce mortality. Digoxin is reserved for patients with worsening or severe heart failure due to left ventricular systolic dysfunction refractory to combination therapy with first-line agents.

Contraindications

Digoxin is contraindicated in:

- Supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome
- Ventricular tachycardia or fibrillation
- Heart conduction problems e.g. second degree or intermittent complete heart block
- Hypertrophic cardiomyopathy (unless concomitant atrial fibrillation and heart failure but should be used with caution)

Cautions

Digoxin should be used with caution in:

- Hypercalcaemia (risk of digitalis toxicity)
- Hypokalaemia (risk of digitalis toxicity; diuretics may predispose to hypokalaemia)
- Hypomagnesaemia (risk of digitalis toxicity)
- Hypoxia (risk of digitalis toxicity)
- Recent myocardial infarction
- Severe respiratory disease
- Sick sinus syndrome
- Thyroid disease
- Constrictive pericarditis
- Renal impairment (reduce dose and monitor plasma-digoxin concentration; toxicity increased by electrolyte disturbances)
- Elderly people (reduce dose)
- Concomitant drug therapy with drugs which may increase plasma concentration of digoxin e.g. amiodarone, antimicrobials, calcium-channel blockers, spironolactone

Adverse effects

The adverse effects of digoxin are frequently due to its narrow therapeutic window and include:

- Cardiac adverse effects
  - Sinoatrial and atrioventricular block
  - Premature ventricular contractions
  - PR prolongation and ST-segment depression
- Nausea, vomiting and diarrhoea
- Blurred or yellow vision
- CNS effects
  - weakness, dizziness, confusion, apathy, malaise, headache, depression, psychosis
- Thrombocytopenia and agranulocytosis (rare)
- Gynaecomastia in men in prolonged administration

Digoxin toxicity

Unwanted effects of digoxin depend on both the plasma concentration of digoxin (increasing risk of toxicity through the range 1.5 – 3 mcg/L) and on the sensitivity of the conducting system or of the myocardium, which is often increased in heart disease. Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Care should also be taken in the elderly who are particularly susceptible to digoxin toxicity.

If toxicity occurs, digoxin should be withdrawn. Digoxin-specific antibody fragments are indicated for the treatment of known or strongly suspected life-threatening digoxin toxicity associated with ventricular arrhythmias or bradyarrhythmias unresponsive to atropine sulfate and when measures beyond the withdrawal of digoxin and correction of any electrolyte abnormalities are considered necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 16 of 121

Regarding streptokinase, which of the following statement is CORRECT:

a Streptokinase is derived from alpha-haemolytic streptococci.

b Streptokinase is fibrin-specific.

c Streptokinase can have a hypertensive effect.

d Streptokinase should not be used again beyond 4 days of first administration of streptokinase.

e Anaphylaxis occurs in up to 10% of patients.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 16 of 121

Regarding streptokinase, which of the following statement is CORRECT:

a) **Streptokinase is derived from alpha-haemolytic streptococci.** ✗
b) Streptokinase is fibrin-specific.
c) Streptokinase can have a hypertensive effect.
d) Streptokinase should not be used again beyond 4 days of first administration of streptokinase. ✓
e) Anaphylaxis occurs in up to 10% of patients.

Answer

Streptokinase (SK) is a single chain polypeptide, derived from beta-haemolytic streptococci. Its lack of fibrin specificity makes it a less desirable thrombolytic drug than tPA compounds because it produces more fibrinogenolysis. Streptokinase is antigenic, and so should not be given to patients who have already been exposed, due to the development of antibodies (after about 4 – 5 days). Prolonged persistence of antibodies to streptokinase can reduce the effectiveness of subsequent treatment; therefore, streptokinase should not be used again beyond 4 days of first administration of streptokinase. Minor allergic reactions may occur in up to 10% of patients – anaphylaxis occurs in less than 0.5% of cases. Hypotension may occur during infusion which usually responds to fluids or slowing of the infusion.

Notes

The value of thrombolytic drugs for the treatment of myocardial infarction has been established. Streptokinase and alteplase have been shown to reduce mortality. Reteplase and tenecteplase are also licensed for acute myocardial infarction. Fibrinolytic therapy carries a risk of bleeding, including cerebral haemorrhage, and not all patients can be given this treatment safely.

Mechanism of action

Fibrinolytic drugs act as thrombolytics by activating plasminogen to form plasmin, which degrades fibrin and so breaks up thrombi.

Alteplase should be given within 6 – 12 hours of symptom onset, reteplase and streptokinase within 12 hours of symptom onset, but ideally all should be given within 1 hour; use after 12 hours requires specialist advice.

Contraindications

- Absolute
  - Previous haemorrhagic stroke
  - Ischaemic stroke during the previous 6 months
  - Central nervous system damage or neoplasm
  - Recent (within 3 weeks) major surgery, head injury or other major trauma
  - Active internal bleeding or gastrointestinal bleeding within the past month
  - Known bleeding disorder
- Relative
  - Refractory hypertension (SBP > 180 mmHg)
  - Transient ischaemic attack during the previous 6 months
  - Oral anticoagulant treatment
  - Pregnancy or less than 1 week postpartum
  - Traumatic CPR
  - Non-compressive vascular puncture
  - Active peptic ulcer disease
  - Advanced liver disease
  - Infective endocarditis
  - Previous allergic reaction to fibrinolytic drug to be used

Adverse effects

- Bleeding (serious bleeding calls for discontinuation of the thrombolytic and may require administration of coagulation factors and antifibrinolytic drugs)
- Nausea and vomiting
- Further embolism (either due to clots that break away from the original thrombus or to cholesterol crystal emboli)
- Hypotension
- Hypersensitivity reactions

Streptokinase

Streptokinase (SK) is a single chain polypeptide, derived from beta-haemolytic streptococci. Its lack of fibrin specificity makes it a less desirable thrombolytic drug than tPA compounds because it produces more fibrinogenolysis. Streptokinase is antigenic, and so should not be given to patients who have already been exposed, due to the development of antibodies (after about 4 – 5 days). Prolonged persistence of antibodies to streptokinase can reduce the effectiveness of subsequent treatment; therefore, streptokinase should not be used again beyond 4 days of first administration of streptokinase. Minor allergic reactions may occur in up to 10% of patients – anaphylaxis occurs in less than 0.5% of cases. Hypotension may occur during infusion which usually responds to fluids or slowing of the infusion.

Alteplase

Alteplase is recombinant tissue-type plasminogen activator (tPA), a naturally occurring fibrin-specific enzyme that has selectivity for activation of fibrin-bound plasminogen. It has a short half-life of 3 – 4 minutes and must be given by continuous intravenous infusion but is not associated with antigenic or hypotensive effects, and can be used in patients when recent streptococcal infections or recent use of streptokinase contraindicates the use of streptokinase.

Reteplase and tenecteplase

Reteplase and tenecteplase are genetically engineered forms of human tPA and have a longer half-life, higher specificity for fibrin, and greater resistance to plasminogen activator inhibitor-1 than native tPA. The increase in half-life permits administration as a bolus rather than by continuous infusion.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 17 of 121

What is the mechanism of action of mannitol:

a Carbonic anhydrase inhibitor

b Aldosterone antagonist

c Osmotic diuretic

d Inhibition of Na+/Cl- cotransporter

e Inhibition of Na+/K+/2Cl- cotransporter

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 17 of 121

What is the mechanism of action of mannitol:

a) Carbonic anhydrase inhibitor
b) Aldosterone antagonist
c) **Osmotic diuretic** ✔
d) Inhibition of Na+/Cl- cotransporter
e) Inhibition of Na+/K+/2Cl- cotransporter

Answer

Mannitol is an osmotic diuretic that can be used to treat cerebral oedema and raised intraocular pressure.

Notes

Mannitol is an osmotic diuretic that can be used to treat cerebral oedema and raised intraocular pressure.

Mechanism of action

Mannitol is an easily filtered, poorly reabsorbed solute that alters the diffusion of water relative to sodium by 'binding' water. As a result, net reabsorption of Na+ is reduced.

Contraindications

Mannitol is contraindicated in:

- Anuria
- Intracranial bleeding (except during craniotomy)
- Severe cardiac failure
- Severe dehydration
- Severe pulmonary oedema

Adverse effects

Common side effects include:

- Fluid and electrolyte imbalance
- Hypotension
- Thrombophlebitis

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 18 of 121

Regarding hypertensive crises, which of the following statements is CORRECT:

a Blood pressure should always be reduced as quickly as possible.

b A hypertensive emergency is defined as a blood pressure ≥ 200/110 mmHg.

c Oral amlodipine is usually first line in management of hypertensive emergencies.

d Hypertensive urgency requires intravenous antihypertensive therapy.

e In a hypertensive emergency, blood pressure should be reduced by 20 – 25% within 2 hours.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 18 of 121

Regarding hypertensive crises, which of the following statements is CORRECT:

a) Blood pressure should always be reduced as quickly as possible.
b) A hypertensive emergency is defined as a blood pressure ≥ 200/110 mmHg.
c) Oral amlodipine is usually first line in management of hypertensive emergencies.
d) **Hypertensive urgency requires intravenous antihypertensive therapy.** ✗
e) In a hypertensive emergency, blood pressure should be reduced by 20 – 25% within 2 hours. ✓

Answer

A hypertensive emergency is defined as severe hypertension (blood pressure ≥ 180/110 mmHg) with acute damage to the target organs. Prompt treatment with intravenous antihypertensive therapy is generally required; over the first few minutes or within 2 hours, blood pressure should be reduced by 20 – 25 %. Severe hypertension without acute target organ damage is defined as hypertensive urgency.; blood pressure should be reduced gradually over 24 – 48 hours with oral antihypertensive therapy. If blood pressure is reduced too quickly in the management of hypertensive crises, there is a risk of reduced organ perfusion leading to cerebral infarction, blindness, deterioration in renal function, and myocardial ischaemia.

Notes

Hypertensive urgency

Severe hypertension (blood pressure ≥ 180/110 mmHg) without acute target organ damage is defined as hypertensive urgency.

Blood pressure should be reduced gradually over 24 – 48 hours with oral antihypertensive therapy, such as labetalol hydrochloride, or the calcium channel blockers amlodipine or felodipine.

Hypertensive emergency

A hypertensive emergency is defined as severe hypertension with acute damage to the target organs (e.g. signs of papilloedema or retinal haemorrhage, or the presence of clinical conditions such as acute coronary syndromes, acute aortic dissection, acute pulmonary oedema, hypertensive encephalopathy, acute cerebral infarction, intracerebral or subarachnoid haemorrhage, eclampsia, or rapidly progressing renal failure).

Prompt treatment with intravenous antihypertensive therapy is generally required; over the first few minutes or within 2 hours, blood pressure should be reduced by 20 – 25 %. When intravenous therapy is indicated, treatment options include sodium nitroprusside, nicardipine, labetalol, glyceryl trinitrate, phentolamine, hydralazine, or esmolol; choice of drug is dependent on concomitant conditions and clinical status of the patient.

If blood pressure is reduced too quickly in the management of hypertensive crises, there is a risk of reduced organ perfusion leading to cerebral infarction, blindness, deterioration in renal function, and myocardial ischaemia.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 19 of 121

Verapamil is contraindicated in which of the following:

a Phaeochromocytoma

b Heart failure

c Asthma

d Diabetes mellitus

e Prinzmetal's angina

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 19 of 121

Verapamil is contraindicated in which of the following:

a) Phaeochromocytoma
b) **Heart failure** ✔
c) Asthma
d) Diabetes mellitus
e) Prinzmetal's angina

Answer

Verapamil hydrochloride and diltiazem hydrochloride should usually be avoided in heart failure because they may further depress cardiac function and cause clinically significant deterioration.

Notes

Calcium channel blockers are widely used in the treatment of angina (second line to beta-blockers) and also for hypertension, heart failure and arrhythmias.

Calcium channel blockers vary widely in their predilection for the various possible sites of action and in their therapeutic effects and may be divided into the dihydropyridine type (e.g. amlodipine, nifedipine and nimodipine) and the rate-limiting non-dihydropyridine type (e.g. verapamil, diltiazem).

Mechanism of action

Calcium channel blockers inhibit L-type voltage-sensitive calcium channels in arterial smooth muscle, causing relaxation and vasodilation. They also block calcium channels within the myocardium and conducting tissues of the heart which produces a negative inotropic effect by reducing calcium influx during the plateau phase of the action potential.

The dihydropyridines have relatively little effect on the heart because they have a much higher affinity for inactivated channels found more frequently in vascular muscle. Furthermore, at clinical doses, vasodilation results in a reflex increase in sympathetic tone that counteracts the mild negative inotropic effect. The non-dihydropyridines are rate-limiting calcium-channel blockers that depress the sinus node and slow conduction in the atrioventricular node, causing a mild resting bradycardia.

Contraindications

Non-dihydropyridine CCBs:

- Atrial flutter or fibrillation
- Heart failure or history of heart failure (may precipitate or aggravate symptoms)
- Cardiac outflow obstruction e.g. significant aortic stenosis or obstructive hypertrophic cardiomyopathy (vasodilation may result in reduced cardiac output)
- Second or third degree AV block (may induce complete AV block)
- Severe bradycardia
- Sick sinus syndrome

Dihydropyridine CCBs:

- Uncontrolled heart failure
- Severe hypotension
- Cardiac outflow obstruction

Adverse effects

- Gastrointestinal adverse effects – constipation, nausea, dyspepsia
- Bradycardia, AV block, reflex tachycardia, palpitations
- Vasodilatory adverse effects – flushing, dizziness, headache, postural hypotension, ankle swelling (more common with dihydropyridine calcium-channel blockers and often improve with continued use, although ankle swelling often persists)
- Gingival hyperplasia
- Malaise and fatigue
- Myalgia and arthralgia

Verapamil

Verapamil is used for the treatment of angina, hypertension, and arrhythmias. Verapamil is highly negatively inotropic and reduces cardiac output, slows the heart rate and may impair atrioventricular conduction. It may precipitate heart failure, exacerbate conduction disorders, and cause hypotension at high doses and should not be used with beta-blockers. Constipation is the most common side effect.

Nifedipine

Nifedipine relaxes vascular smooth muscle and dilates coronary and peripheral arteries. Nifedipine has less myocardial effects than verapamil and has no antiarrhythmic properties but has more influence on the vessels. Unlike verapamil it rarely precipitates heart failure because any negative inotropic effect is offset by a reduction in left ventricular work.

Nimodipine

Nimodipine is related to nifedipine but the smooth muscle relaxant effects preferentially act on cerebral arteries. It is used solely for the prevention and treatment of vascular spasm following aneurysmal subarachnoid haemorrhage.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 20 of 121

Loop diuretics are primarily indicated for which of the following:

a Acute pulmonary oedema

b Cerebral oedema

c Hypertension

d Acute angle-closure glaucoma

e Ascites secondary to liver cirrhosis

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 20 of 121

Loop diuretics are primarily indicated for which of the following:

a) **Acute pulmonary oedema** ✔
b) Cerebral oedema
c) Hypertension
d) Acute angle-closure glaucoma
e) Ascites secondary to liver cirrhosis

Answer

Loop diuretics are powerful diuretics used in acute pulmonary oedema due to left ventricular failure; intravenous administration produces relief of breathlessness and reduces preload sooner than would be expected from the time of onset of diuresis. They are also used in oedema in patients with chronic heart failure; diuretic-resistant oedema can be treated with a loop diuretic combined with a thiazide or related diuretic. If necessary, a loop diuretic can be added to antihypertensive treatment to achieve better control of blood pressure in those with resistant hypertension, or in patients with impaired renal function or heart failure.

Notes

Indications

Loop diuretics are powerful diuretics used in acute pulmonary oedema due to left ventricular failure; intravenous administration produces relief of breathlessness and reduces preload sooner than would be expected from the time of onset of diuresis.

They are also used in oedema in patients with chronic heart failure; diuretic-resistant oedema can be treated with a loop diuretic combined with a thiazide or related diuretic.

If necessary, a loop diuretic can be added to antihypertensive treatment to achieve better control of blood pressure in those with resistant hypertension, or in patients with impaired renal function or heart failure.

Mechanism of action

Loop diuretics inhibit the Na+/K+/2Cl- symporter on the luminal membrane in the thick ascending limb of the loop of Henle, thus preventing reabsorption of NaCl and water. These agents reduce reabsorption of Cl- and Na+ and increase Ca2+ excretion and loss of K+ and Mg2+.

Furosemide and bumetanide are similar in activity; both act within 1 hour of oral administration and diuresis is complete within 6 hours so that, if necessary, they can be given twice in one day without interfering with sleep. Following intravenous administration furosemide has a peak effect within 30 minutes. The diuresis associated with these drugs is dose related.

Contraindications

Loop diuretics are contraindicated in:

- Hypovolaemia and dehydration
- Severe hypokalaemia or severe hyponatraemia
- Anuria, acute kidney injury or chronic kidney disease due to nephrotoxic drugs
- Comatose and pre-comatose states associated with liver cirrhosis

Cautions

Loop diuretics can exacerbate diabetes (but hyperglycaemia is less likely than with thiazides) and gout.

If there is an enlarged prostate, urinary retention can occur, although this is less likely if small doses and less potent diuretics are used initially.

Hypotension, hypovolaemia and electrolyte disturbance should be corrected before initiation of treatment.

Hepatorenal syndrome; hypoproteinaemia may reduce diuretic effect and increase risk of side-effects.

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects.

Adverse effects

Adverse effects of loop diuretics include:

- Mild gastrointestinal disturbances, pancreatitis and hepatic encephalopathy
- Hyperglycaemia
- Acute urinary retention
- Water and electrolyte imbalance
  - Hyponatraemia, hypocalcaemia, hypokalaemia, hypomagnesaemia, hypochloraemia
- Hypotension, hypovolaemia, dehydration, and venous thromboembolism
- Metabolic alkalosis
- Hyperuricaemia
- Blood disorders (bone marrow suppression, thrombocytopenia, and leucopenia)
- Visual disturbance, tinnitus and deafness
- Hypersensitivity reactions

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic.

Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements. In hepatic failure, hypokalaemia caused by diuretics can precipitate encephalopathy, particularly in alcoholic cirrhosis.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 21 of 121

Which of the following drugs may enhance the anticoagulant effect of warfarin:

a St John's wort

b Rifampicin

c Carbamazepine

d Amiodarone

e Azathioprine

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 21 of 121

Which of the following drugs may enhance the anticoagulant effect of warfarin:

a) St John's wort
b) Rifampicin ✖
c) Carbamazepine
d) Amiodarone ✔
e) Azathioprine

Answer

Increased anticoagulant effect	Decreased anticoagulant effect
Alcohol	Tricyclic antidepressants
Amiodarone	St John's wort
Antibiotics(co-trimoxazole, metronidazole, quinolones, macrolides)	Vitamin K-containing vitamin complexes, some enteral feeds, mineral supplements, and green vegetables
Antidepressants (SSRIs, SNRIs, TCAs)	Rifampicin
Azoles	Carbamazepine
Cranberry juice	Phenobarbital
Corticosteroids	Primidone
Fibrates	Azathioprine
NSAIDs	Phenytoin
Thyroxine	Griseofulvin

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Warfarin is a vitamin K antagonist and will reduce the activity of vitamin-K dependent clotting factors (factors VII, IX, X and II) and of protein C and S.

Both the PT and APTT are usually prolonged but the PT is grossly prolonged and the APTT only mildly.

Indications

Warfarin is licensed for:

- Prophylaxis of systemic embolism in people with rheumatic heart disease and atrial fibrillation
- Prophylaxis after insertion of prosthetic heart valves
- Prophylaxis and treatment of venous thrombosis and pulmonary embolism
- Transient attacks of cerebral ischaemia

Warfarin takes at least 48 to 72 hours for the anticoagulant effect to develop and if an immediate effect is required, heparin must be given concomitantly and continued for at least 5 days and until the INR is greater or equal to 2.0 for more than 24 hours. The duration of treatment is dependent on the indication.

Contraindications

- Haemorrhagic stroke
- Clinically significant bleeding
- Within 72 hours of major surgery with risk of severe bleeding
- Within 48 hours postpartum
- Pregnancy
- Untreated bleeding disorders for example, thrombocytopenia, haemophilia, liver failure and renal failure
- Potential bleeding lesions for example; active peptic ulcer; oesophageal varices; aneurysm; proliferative retinopathy; recent organ biopsy; recent trauma or surgery to head, orbit, or spine; recent stroke; confirmed intracranial or intraspinal bleed

Cautions

Warfarin should be used with caution in any patient at increased risk of haemorrhage with risk factors including:

- People aged over 65 years
- Previous bleeding episode, history of gastrointestinal bleeding or anaemia
- Recent ischaemic stroke, hypertension, heart disease, cerebrovascular disease, renal disease, liver disease, active peptic ulcer
- Recent or imminent surgery or trauma
- Excessive alcohol intake, frequent or significant falls
- Regular use of NSAIDs or other drugs that increase risk of bleeding

Adverse effects

- The most common adverse effect of warfarin is bleeding
- Other common adverse effects of warfarin include nausea, vomiting, diarrhoea, jaundice, hepatic dysfunction, pancreatitis, pyrexia, alopecia, purpura, and rash
- Skin necrosis is a rare but serious adverse effect of warfarin; treatment with warfarin should be stopped if warfarin related skin necrosis is suspected
- Calciphylaxis is a rare, but a very serious condition that causes vascular calcification and cutaneous necrosis

Monitoring

The prothrombin time, reported as the INR is used to monitor warfarin therapy; the target INR is dependent on the indication.

Warfarin may need to be omitted for a couple of doses if the INR rises above the target range or even reversed if the INR is > 8.0 or there are signs of bleeding. Phytomenadione (vitamin K) can be given as a specific antidote to warfarin or in cases of major bleeding, dried prothrombin complex (factors II, VII, IX, and X); if dried prothrombin complex is unavailable, fresh frozen plasma can be given but is less effective.

Scenario	Management
INR 5.0 – 8.0, no bleeding	Withhold 1 – 2 doses of warfarin and reduce subsequent maintenance dose
INR 5.0 – 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, restart warfarin when INR < 5.0
INR > 8.0, no bleeding	Stop warfarin, give phytomenadione orally, restart warfarin when INR < 5.0
INR > 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, repeat dose if INR still too high after 24 h, restart warfarin when INR < 5.0
Major bleeding	Stop warfarin, give phytomenadione intravenously, give dried prothrombin complex

Drug interactions

Increased anticoagulant effect	Decreased anticoagulant effect
Alcohol	Tricyclic antidepressants
Amiodarone	St John's wort
Antibiotics(co-trimoxazole, metronidazole, quinolones, macrolides)	Vitamin K-containing vitamin complexes, some enteral feeds, mineral supplements, and green vegetables
Antidepressants (SSRIs, SNRIs, TCAs)	Rifampicin
Azoles	Carbamazepine
Cranberry juice	Phenobarbital
Corticosteroids	Primidone
Fibrates	Azathioprine
NSAIDs	Phenytoin
Thyroxine	Griseofulvin

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 22 of 121

Statins are contraindicated in which of the following:

a Heart failure

b Hyponatraemia

c Pregnant women

d Gout

e Addison's disease

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 22 of 121

Statins are contraindicated in which of the following:

a) Heart failure
b) Hyponatraemia
c) **Pregnant women** ✔
d) Gout
e) Addison's disease

Answer

Statins should be avoided in pregnancy (discontinue 3 months before attempting to conceive) as congenital anomalies have been reported and the decreased synthesis of cholesterol possibly affects fetal development.

Notes

Statins may be used for primary or secondary prevention of cardiovascular disease and for treatment of primary or familial hypercholesterolaemia.

Statins are more effective than other lipid-regulating drugs at lowering LDL-cholesterol concentration but they are less effective than the fibrates in reducing triglyceride concentration. However, statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Mechanism of action

Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase, an enzyme involved in cholesterol synthesis. Inhibition of HMG CoA reductase reduces low-density lipoprotein (LDL) cholesterol levels by slowing down the production of cholesterol in the liver and increasing the liver's ability to remove the LDL cholesterol already in the blood.

Indications

Statins should be offered to all patients, including the elderly, with cardiovascular disease such as those with coronary heart disease (including history of angina or acute myocardial infarction) or occlusive arterial disease (including peripheral vascular disease, non-haemorrhagic stroke, or transient ischaemic attacks). The use of statins should be considered in patients with a high risk of developing cardiovascular disease (primary prevention) which can be assessed using risk calculators.

Contraindications

Statins should be avoided in:

- People with active liver disease
- People with transaminase (alanine aminotransferase or aspartate aminotransferase) levels that are three or more times the upper limit of normal
- Pregnant or breastfeeding women (discontinue 3 months before attempting to conceive)

Cautions

Statins should be used with caution in people:

- With a history of liver disease
- Who consume high level of alcohol
- With predisposing factors for rhabdomyolysis such as older age (> 70 years), concomitant use with an interacting drug, renal impairment, hypothyroidism, and personal or familial history of hereditary muscular disorders

Adverse effects

Adverse effects of statins include:

- Headache
- Epistaxis
- Gastrointestinal disorders (such as constipation, flatulence, dyspepsia, nausea, and diarrhoea)
- Musculoskeletal and connective tissue disorders (such as myalgia, arthralgia, pain in the extremity, muscle spasms, joint swelling, and back pain)
- Hyperglycaemia and diabetes
- Myopathy and rhabdomyolysis
- Interstitial lung disease
- Hepatotoxicity

Muscle effects

The risk of myopathy, myositis, and rhabdomyolysis associated with statin use is rare. Although myalgia has been reported commonly in patients receiving statins, muscle toxicity truly attributable to statin use is rare.

Muscle toxicity can occur with all statins, however the likelihood increases with higher doses and in certain patients. Statins should be used with caution in patients at increased risk of muscle toxicity, including those with a personal or family history of muscular disorders, previous history of muscular toxicity, a high alcohol intake, renal impairment or hypothyroidism.

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 23 of 121

Which of the following is NOT an adverse effect associated with statin therapy:

a Hepatotoxicity

b Rhabdomyolysis

c Interstitial lung disease

d Pancreatitis

e Hyperglycaemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 23 of 121

Which of the following is NOT an adverse effect associated with statin therapy:

a) Hepatotoxicity
b) **Rhabdomyolysis** ✖
c) Interstitial lung disease
d) Pancreatitis ✔
e) Hyperglycaemia

Answer

Adverse effects of statins include:

- Headache
- Epistaxis
- Gastrointestinal disorders (such as constipation, flatulence, dyspepsia, nausea, and diarrhoea)
- Musculoskeletal and connective tissue disorders (such as myalgia, arthralgia, pain in the extremity, muscle spasms, joint swelling, and back pain)
- Hyperglycaemia and diabetes
- Myopathy and rhabdomyolysis
- Interstitial lung disease
- Hepatotoxicity

Notes

Statins may be used for primary or secondary prevention of cardiovascular disease and for treatment of primary or familial hypercholesterolaemia.

Statins are more effective than other lipid-regulating drugs at lowering LDL-cholesterol concentration but they are less effective than the fibrates in reducing triglyceride concentration. However, statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Mechanism of action

Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase, an enzyme involved in cholesterol synthesis. Inhibition of HMG CoA reductase reduces low-density lipoprotein (LDL) cholesterol levels by slowing down the production of cholesterol in the liver and increasing the liver's ability to remove the LDL cholesterol already in the blood.

Indications

Statins should be offered to all patients, including the elderly, with cardiovascular disease such as those with coronary heart disease (including history of angina or acute myocardial infarction) or occlusive arterial disease (including peripheral vascular disease, non-haemorrhagic stroke, or transient ischaemic attacks). The use of statins should be considered in patients with a high risk of developing cardiovascular disease (primary prevention) which can be assessed using risk calculators.

Contraindications

Statins should be avoided in:

- People with active liver disease
- People with transaminase (alanine aminotransferase or aspartate aminotransferase) levels that are three or more times the upper limit of normal
- Pregnant or breastfeeding women (discontinue 3 months before attempting to conceive)

Cautions

Statins should be used with caution in people:

- With a history of liver disease
- Who consume high level of alcohol
- With predisposing factors for rhabdomyolysis such as older age (> 70 years), concomitant use with an interacting drug, renal impairment, hypothyroidism, and personal or familial history of hereditary muscular disorders

Adverse effects

Adverse effects of statins include:

- Headache
- Epistaxis
- Gastrointestinal disorders (such as constipation, flatulence, dyspepsia, nausea, and diarrhoea)
- Musculoskeletal and connective tissue disorders (such as myalgia, arthralgia, pain in the extremity, muscle spasms, joint swelling, and back pain)
- Hyperglycaemia and diabetes
- Myopathy and rhabdomyolysis
- Interstitial lung disease
- Hepatotoxicity

Muscle effects

The risk of myopathy, myositis, and rhabdomyolysis associated with statin use is rare. Although myalgia has been reported commonly in patients receiving statins, muscle toxicity truly attributable to statin use is rare.

Muscle toxicity can occur with all statins, however the likelihood increases with higher doses and in certain patients. Statins should be used with caution in patients at increased risk of muscle toxicity, including those with a personal or family history of muscular disorders, previous history of muscular toxicity, a high alcohol intake, renal impairment or hypothyroidism.

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 24 of 121

What is the mechanism of action of lidocaine as an anti-arrhythmic drug:

a Blocks L-type calcium channels

b Blocks inactivated Na+ channels

c Blocks open Na+ channels

d Opens ACh-sensitive K+ channels

e Stimulates vagal activity

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 24 of 121

What is the mechanism of action of lidocaine as an anti-arrhythmic drug:

a) Blocks L-type calcium channels
b) Blocks inactivated Na+ channels ✔
c) **Blocks open Na+ channels** ✘
d) Opens ACh-sensitive K+ channels
e) Stimulates vagal activity

Answer

Lidocaine is a class Ib agent which blocks inactivated voltage-dependent Na+ channels, making it highly selective for damaged tissues. In normal cardiac tissues, lidocaine has little effect because it dissociates rapidly from the Na+ channels which therefore recover during diastole. However, in ischaemic areas, where anoxia causes depolarisation and arrhythmogenic activity, many Na+ channels are inactivated and therefore susceptible to lidocaine.

Notes

Intravenous lidocaine hydrochloride can be used for the treatment of ventricular tachycardia in haemodynamically stable patients, and ventricular fibrillation and pulseless ventricular tachycardia in cardiac arrest refractory to defibrillation, however it is a second-line choice (behind amiodarone).

Mechanism of action

Lidocaine is a class Ib agent which blocks inactivated voltage-dependent Na+ channels, making it highly selective for damaged tissues. In normal cardiac tissues, lidocaine has little effect because it dissociates rapidly from the Na+ channels which therefore recover during diastole. However, in ischaemic areas, where anoxia causes depolarisation and arrhythmogenic activity, many Na+ channels are inactivated and therefore susceptible to lidocaine.

Contraindications

Intravenous lidocaine is contraindicated in:

- All grades of atrioventricular block
- Severe myocardial depression
- Sinoatrial disorders

Cautions

Intravenous lidocaine should be used with caution in:

- Acute porphyria (consider infusion with glucose for its anti-porphyrinogenic effects)
- Congestive cardiac failure (consider lower dose)
- Post cardiac surgery (consider lower dose)

Adverse effects

Common side effects of intravenous lidocaine include:

- Bradycardia and hypotension (may lead to cardiac arrest)
- Dizziness, drowsiness, paraesthesia, confusion (particularly if injection too rapid)
- Convulsions
- Respiratory depression

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 25 of 121

Regarding ACE inhibitors, which of the following statements is INCORRECT:

a Afro-Caribbean patients may respond less well to ACE inhibitors.

b Concomitant treatment with NSAIDs increases the risk of renal damage.

c ACE inhibitors are contraindicated in diabetic nephropathy.

d Concomitant treatment with spironolactone increase the risk of hyperkalaemia.

e Inhibition of breakdown of bradykinin may result in a non-allergic angioedema.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 25 of 121

Regarding ACE inhibitors, which of the following statements is INCORRECT:

a) Afro-Caribbean patients may respond less well to ACE inhibitors.
b) Concomitant treatment with NSAIDs increases the risk of renal damage.
c) ACE inhibitors are contraindicated in diabetic nephropathy. ✔
d) Concomitant treatment with spironolactone increase the risk of hyperkalaemia.
e) **Inhibition of breakdown of bradykinin may result in a non-allergic angioedema.** ✖

Answer

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

The remaining statements are correct.

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 26 of 121

Which of the following is NOT a common side effect of adenosine:

a Angina

b AV block

c Flushing

d Dyspnoea

e Yellow vision

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 26 of 121

Which of the following is NOT a common side effect of adenosine:

a) Angina
b) AV block
c) Flushing
d) Dyspnoea
e) Yellow vision ✔

Answer

Common side effects of adenosine include:

- Apprehension
- Dizziness, flushing, headache, nausea, dyspnoea
- Angina (discontinue)
- AV block, sinus pause and arrhythmia (discontinue if asystole or severe bradycardia occur)

Notes

Adenosine is usually the treatment of choice for terminating paroxysmal supraventricular tachycardia including those associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome.

Mechanism of action

Adenosine stimulates A1-adenosine receptors and opens acetylcholine sensitive K+ channels, increasing K+ efflux. This hyperpolarises the cell membrane in the atrioventricular node and, by inhibiting the calcium channels, slows conduction in the AVN. As it has a very short duration of action (half-life only about 8 – 10 seconds), most side effects are short lived.

Administration

For a regular narrow-complex tachycardia the first step is to attempt vagal manoeuvres. If this is unsuccessful and the tachyarrhythmia persists, 6 mg intravenous adenosine should be administered into a central/large vein over 2 seconds, followed by 12 mg after 1 – 2 minutes if required, then a further 12 mg after 1 – 2 minutes if required (max 30 mg).

The effects of adenosine are potentiated by dipyridamole, therefore if it is essential to give adenosine in a patient taking dipyridamole the dose should be quartered.

The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection. If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.

Contraindications

Adenosine is contraindicated in:

- Asthma and COPD (can cause bronchospasm)
- Decompensated heart failure
- Long QT syndrome
- Second- or third-degree AV block and sick sinus syndrome (unless pacemaker fitted)
- Severe hypotension

Adverse effects

Common side effects of adenosine include:

- Apprehension
- Dizziness, flushing, headache, nausea, dyspnoea
- Angina (discontinue)
- AV block, sinus pause and arrhythmia (discontinue if asystole or severe bradycardia occur)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 27 of 121

In adult advanced life support, which of the following best describes the correct administration of amiodarone for a shockable rhythm:

a Give 300 mg IV amiodarone after 3 shocks

b Give 300 mg IV amiodarone after 3 – 5 minutes of onset of CPR

c Give 300 mg IV amiodarone as soon as IV access has been achieved

d Give 300 mg IV amiodarone after 3 shocks, and then every 3 – 5 minutes thereafter

e Give 300 mg IV amiodarone after the first shock

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 27 of 121

In adult advanced life support, which of the following best describes the correct administration of amiodarone for a shockable rhythm:

a) **Give 300 mg IV amiodarone after 3 shocks** ✔
b) Give 300 mg IV amiodarone after 3 – 5 minutes of onset of CPR
c) Give 300 mg IV amiodarone as soon as IV access has been achieved
d) Give 300 mg IV amiodarone after 3 shocks, and then every 3 – 5 minutes thereafter
e) Give 300 mg IV amiodarone after the first shock

Answer

IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Notes

Basic life support

- For chest compressions in adult basic life support the heel of one hand should be placed over the middle of the lower half of the patient's sternum with the other hand on top.
- The sternum should be depressed to a depth of 5 – 6 cm.
- Chest compressions should be performed at a rate of 100 – 120 per minute.
- Thirty compressions should be given before two breaths and that ratio continued (30:2).
- The person giving CPR should be changed every 2 minutes if possible to avoid exhaustion and poor quality chest compressions.
- Interruptions should be minimised (pauses should be < 5 seconds).

Advanced life support

- In adult advanced life support, basic life support should continue whilst the defibrillator pads are attached and the airway managed.
- The pads should be positioned one to the right of the upper sternum below the clavicle and the other in the left midaxillary line in the 5th intercostal space.
- Chest compressions should be paused briefly (< 5 secs) to assess the rhythm and then continued as the defibrillator charges if a shockable rhythm is identified or continued for a further two whole minutes if a non-shockable rhythm is identified.
- When delivering a shock, everybody should be clear of the patient (and any GTN patches and oxygen sources removed).
- Once the shock has been delivered, compressions should resume immediately and continue for a further two minutes before checking the rhythm again or feeling for a pulse.

Shockable rhythm (ventricular fibrillation or pulseless ventricular tachycardia)

- IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter.
- IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Non-shockable rhythm (asystole or pulseless electrical activity)

- IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 28 of 121

In adult basic life support, chest compressions and breaths should be given in which of the following ratios:

a 30 compressions : 1 breath

b 30 compressions : 2 breaths

c 15 compressions: 1 breath

d 15 compressions: 2 breaths

e 30 compressions: 5 breaths

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 28 of 121

In adult basic life support, chest compressions and breaths should be given in which of the following ratios:

a) 30 compressions : 1 breath
b) **30 compressions : 2 breaths** ✔
c) 15 compressions: 1 breath
d) 15 compressions: 2 breaths
e) 30 compressions: 5 breaths

Answer

Thirty compressions should be given before two breaths and that ratio continued (30:2).

Notes

Basic life support

- For chest compressions in adult basic life support the heel of one hand should be placed over the middle of the lower half of the patient's sternum with the other hand on top.
- The sternum should be depressed to a depth of 5 – 6 cm.
- Chest compressions should be performed at a rate of 100 – 120 per minute.
- Thirty compressions should be given before two breaths and that ratio continued (30:2).
- The person giving CPR should be changed every 2 minutes if possible to avoid exhaustion and poor quality chest compressions.
- Interruptions should be minimised (pauses should be < 5 seconds).

Advanced life support

- In adult advanced life support, basic life support should continue whilst the defibrillator pads are attached and the airway managed.
- The pads should be positioned one to the right of the upper sternum below the clavicle and the other in the left midaxillary line in the 5th intercostal space.
- Chest compressions should be paused briefly (< 5 secs) to assess the rhythm and then continued as the defibrillator charges if a shockable rhythm is identified or continued for a further two whole minutes if a non-shockable rhythm is identified.
- When delivering a shock, everybody should be clear of the patient (and any GTN patches and oxygen sources removed).
- Once the shock has been delivered, compressions should resume immediately and continue for a further two minutes before checking the rhythm again or feeling for a pulse.

Shockable rhythm (ventricular fibrillation or pulseless ventricular tachycardia)

- IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter.
- IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Non-shockable rhythm (asystole or pulseless electrical activity)

- IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 29 of 121

What is the mechanism of cough in ACE inhibitor therapy:

a Increased histamine release

b Decreased bradykinin breakdown

c Direct stimulation of irritant receptors

d Increased production of prostaglandin

e Increased mast cell degranulation

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 29 of 121

What is the mechanism of cough in ACE inhibitor therapy:

a) Increased histamine release
b) **Decreased bradykinin breakdown** ✔
c) Direct stimulation of irritant receptors
d) Increased production of prostaglandin
e) Increased mast cell degranulation

Answer

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 30 of 121

The risk of hyperkalaemia in a patient on ACE inhibitor therapy is increased by concomitant treatment with which of the following drugs:

a Bendoflumethiazide

b Furosemide

c Spironolactone

d Ibuprofen

e Bisoprolol

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 30 of 121

The risk of hyperkalaemia in a patient on ACE inhibitor therapy is increased by concomitant treatment with which of the following drugs:

a) Bendoflumethiazide
b) Furosemide
c) Spironolactone ✔
d) Ibuprofen
e) **Bisoprolol** ✖

Answer

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 31 of 121

A tachyarrhythmia is defined as narrow-complex if the QRS duration is:

a Less than 0.2 s

b Less than 0.12 s

c Equal to or less than 0.16 s

d Less than 0.10 s

e Less than 0.16 s

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 31 of 121

A tachyarrhythmia is defined as narrow-complex if the QRS duration is:

a) Less than 0.2 s
b) **Less than 0.12 s** ✔
c) Equal to or less than 0.16 s
d) Less than 0.10 s
e) Less than 0.16 s

Answer

If the patient with a tachyarrhythmia is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin)** should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 32 of 121

A patient requires antibiotic treatment for an infection. You are aware that the patient is on long-term statin therapy. Which of the following antibiotics may increase the risk of myopathy in this patient:

a Flucloxacillin

b Doxycycline

c Clarithromycin

d Ciprofloxacin

e Metronidazole

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 32 of 121

A patient requires antibiotic treatment for an infection. You are aware that the patient is on long-term statin therapy. Which of the following antibiotics may increase the risk of myopathy in this patient:

a) Flucloxacillin
b) Doxycycline
c) Clarithromycin ✔
d) Ciprofloxacin ✖
e) Metronidazole

Answer

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

Notes

Statins may be used for primary or secondary prevention of cardiovascular disease and for treatment of primary or familial hypercholesterolaemia.

Statins are more effective than other lipid-regulating drugs at lowering LDL-cholesterol concentration but they are less effective than the fibrates in reducing triglyceride concentration. However, statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Mechanism of action

Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase, an enzyme involved in cholesterol synthesis. Inhibition of HMG CoA reductase reduces low-density lipoprotein (LDL) cholesterol levels by slowing down the production of cholesterol in the liver and increasing the liver's ability to remove the LDL cholesterol already in the blood.

Indications

Statins should be offered to all patients, including the elderly, with cardiovascular disease such as those with coronary heart disease (including history of angina or acute myocardial infarction) or occlusive arterial disease (including peripheral vascular disease, non-haemorrhagic stroke, or transient ischaemic attacks). The use of statins should be considered in patients with a high risk of developing cardiovascular disease (primary prevention) which can be assessed using risk calculators.

Contraindications

Statins should be avoided in:

- People with active liver disease
- People with transaminase (alanine aminotransferase or aspartate aminotransferase) levels that are three or more times the upper limit of normal
- Pregnant or breastfeeding women (discontinue 3 months before attempting to conceive)

Cautions

Statins should be used with caution in people:

- With a history of liver disease
- Who consume high level of alcohol
- With predisposing factors for rhabdomyolysis such as older age (> 70 years), concomitant use with an interacting drug, renal impairment, hypothyroidism, and personal or familial history of hereditary muscular disorders

Adverse effects

Adverse effects of statins include:

- Headache
- Epistaxis
- Gastrointestinal disorders (such as constipation, flatulence, dyspepsia, nausea, and diarrhoea)
- Musculoskeletal and connective tissue disorders (such as myalgia, arthralgia, pain in the extremity, muscle spasms, joint swelling, and back pain)
- Hyperglycaemia and diabetes
- Myopathy and rhabdomyolysis
- Interstitial lung disease
- Hepatotoxicity

Muscle effects

The risk of myopathy, myositis, and rhabdomyolysis associated with statin use is rare. Although myalgia has been reported commonly in patients receiving statins, muscle toxicity truly attributable to statin use is rare.

Muscle toxicity can occur with all statins, however the likelihood increases with higher doses and in certain patients. Statins should be used with caution in patients at increased risk of muscle toxicity, including those with a personal or family history of muscular disorders, previous history of muscular toxicity, a high alcohol intake, renal impairment or hypothyroidism.

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 33 of 121

What is the mechanism of action of simvastatin:

a Selectively inhibits intestinal absorption of cholesterol

b Reduces the release of VLDL by the liver

c Stimulates lipoprotein lipase

d Increases cholesterol excretion by binding to bile acids and preventing their reabsorption

e Decreases hepatic cholesterol synthesis through inhibition of HMG CoA reductase

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 33 of 121

What is the mechanism of action of simvastatin:

a) Selectively inhibits intestinal absorption of cholesterol
b) Reduces the release of VLDL by the liver
c) Stimulates lipoprotein lipase
d) **Increases cholesterol excretion by binding to bile acids and preventing their reabsorption** ✖
e) Decreases hepatic cholesterol synthesis through inhibition of HMG CoA reductase ✔

Answer

Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase, an enzyme involved in cholesterol synthesis. Inhibition of HMG CoA reductase reduces low-density lipoprotein (LDL) cholesterol levels by slowing down the production of cholesterol in the liver and increasing the liver's ability to remove the LDL cholesterol already in the blood.

Notes

Statins may be used for primary or secondary prevention of cardiovascular disease and for treatment of primary or familial hypercholesterolaemia.

Statins are more effective than other lipid-regulating drugs at lowering LDL-cholesterol concentration but they are less effective than the fibrates in reducing triglyceride concentration. However, statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Mechanism of action

Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase, an enzyme involved in cholesterol synthesis. Inhibition of HMG CoA reductase reduces low-density lipoprotein (LDL) cholesterol levels by slowing down the production of cholesterol in the liver and increasing the liver's ability to remove the LDL cholesterol already in the blood.

Indications

Statins should be offered to all patients, including the elderly, with cardiovascular disease such as those with coronary heart disease (including history of angina or acute myocardial infarction) or occlusive arterial disease (including peripheral vascular disease, non-haemorrhagic stroke, or transient ischaemic attacks). The use of statins should be considered in patients with a high risk of developing cardiovascular disease (primary prevention) which can be assessed using risk calculators.

Contraindications

Statins should be avoided in:

- People with active liver disease
- People with transaminase (alanine aminotransferase or aspartate aminotransferase) levels that are three or more times the upper limit of normal
- Pregnant or breastfeeding women (discontinue 3 months before attempting to conceive)

Cautions

Statins should be used with caution in people:

- With a history of liver disease
- Who consume high level of alcohol
- With predisposing factors for rhabdomyolysis such as older age (> 70 years), concomitant use with an interacting drug, renal impairment, hypothyroidism, and personal or familial history of hereditary muscular disorders

Adverse effects

Adverse effects of statins include:

- Headache
- Epistaxis
- Gastrointestinal disorders (such as constipation, flatulence, dyspepsia, nausea, and diarrhoea)
- Musculoskeletal and connective tissue disorders (such as myalgia, arthralgia, pain in the extremity, muscle spasms, joint swelling, and back pain)
- Hyperglycaemia and diabetes
- Myopathy and rhabdomyolysis
- Interstitial lung disease
- Hepatotoxicity

Muscle effects

The risk of myopathy, myositis, and rhabdomyolysis associated with statin use is rare. Although myalgia has been reported commonly in patients receiving statins, muscle toxicity truly attributable to statin use is rare.

Muscle toxicity can occur with all statins, however the likelihood increases with higher doses and in certain patients. Statins should be used with caution in patients at increased risk of muscle toxicity, including those with a personal or family history of muscular disorders, previous history of muscular toxicity, a high alcohol intake, renal impairment or hypothyroidism.

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 34 of 121

Sodium nitroprusside is contraindicated in which of the following:

a Peripheral artery disease

b Severe B12 deficiency

c Heart failure

d Myasthenia gravis

e Asthma

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 34 of 121

Sodium nitroprusside is contraindicated in which of the following:

a) Peripheral artery disease
b) Severe B12 deficiency ✔
c) Heart failure
d) **Myasthenia gravis** ✖
e) Asthma

Answer

Sodium nitroprusside is contraindicated in

- Compensatory hypertension
- Leber's optic atrophy
- Severe vitamin B12 deficiency

Notes

Sodium nitroprusside decomposes in the blood to release nitric oxide, an unstable compound that causes vasodilation.

Indications

Sodium nitroprusside is indicated for

- Hypertensive emergencies
- Controlled hypotension in anaesthesia during surgery
- Acute or chronic heart failure

Contraindications

It is contraindicated in

- Compensatory hypertension
- Leber's optic atrophy
- Severe vitamin B12 deficiency

Cautions

It is should be used with caution in

- Elderly
- Hyponatraemia
- Hypothermia
- Hypothyroidism
- Impaired cerebral circulation
- Ischaemic heart disease

Adverse effects

Side effects associated with over rapid reduction in blood pressure include: headache, dizziness, nausea, retching, abdominal pain, perspiration, palpitation, anxiety, retrosternal discomfort; the infusion rate should be reduced if any of these side effects occur.

Side effects caused by excessive plasma concentration of the cyanide metabolite include tachycardia, sweating, hyperventilation, arrhythmias, marked metabolic acidosis; the drug should be discontinued and the cyanide antidote given if these effects occur.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 35 of 121

Which of the following is NOT a typical side effect of digoxin:

a Yellow vision

b Diarrhoea

c Hypokalaemia

d Arrhythmias

e Gynaecomastia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 35 of 121

Which of the following is NOT a typical side effect of digoxin:

a) Yellow vision ✗
b) Diarrhoea
c) Hypokalaemia ✓
d) Arrhythmias
e) Gynaecomastia

Answer

Digoxin does not cause hypokalaemia, but hypokalaemia does potentiate digoxin toxicity.

The adverse effects of digoxin are frequently due to its narrow therapeutic window and include:

- Cardiac adverse effects
  - Sinoatrial and atrioventricular block
  - Premature ventricular contractions
  - PR prolongation and ST-segment depression
- Nausea, vomiting and diarrhoea
- Blurred or yellow vision
- CNS effects
  - weakness, dizziness, confusion, apathy, malaise, headache, depression, psychosis
- Thrombocytopenia and agranulocytosis (rare)
- Gynaecomastia in men in prolonged administration

Notes

Digoxin is a cardiac glycoside that increases the force of myocardial contraction (positive inotrope), and slows the heart rate (negative chronotrope). Digoxin has a narrow therapeutic index; digoxin toxicity can occur even when the serum digoxin concentration is within the therapeutic range (between 0.7 – 2.0 mcg/L).

Mechanism of action

Inotropic effect:

Digoxin inhibits membrane Na+/K+ ATPase, which is responsible for Na+/K+ exchange across the myocyte cell membrane. This increases intracellular Na+ and produces a secondary increase in intracellular Ca2+ that increases the force of myocardial contraction. The increase in intracellular Ca2+ occurs because the decreased Na+ gradient across the membrane reduces the extrusion of Ca2+ by the Na+/Ca2+ exchanger that normally occurs during diastole. Digoxin and K+ ions compete for the receptor on the outside of the muscle cell membrane, and so the effects of digoxin may be dangerously increased in hypokalaemia.

Chronotropic effect:

Digoxin stimulates vagal activity , causing the release of ACh, which slows the heart rate, slows atrioventricular conduction and prolongs the refractory period in the AVN and bundle of His. By delaying AV conduction, digoxin increases the degree of block, and slows and strengthens the ventricular beat.

Indications

Digoxin is most useful for controlling the ventricular response in persistent and permanent atrial fibrillation and atrial flutter. Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation. It is now rarely used for rapid control of heart rate, as even with intravenous administration, response may take many hours.

Digoxin also has a role in the management of heart failure; digoxin improves symptoms of heart failure and exercise tolerance and reduces hospitalisation due to acute exacerbations but it does not reduce mortality. Digoxin is reserved for patients with worsening or severe heart failure due to left ventricular systolic dysfunction refractory to combination therapy with first-line agents.

Contraindications

Digoxin is contraindicated in:

- Supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome
- Ventricular tachycardia or fibrillation
- Heart conduction problems e.g. second degree or intermittent complete heart block
- Hypertrophic cardiomyopathy (unless concomitant atrial fibrillation and heart failure but should be used with caution)

Cautions

Digoxin should be used with caution in:

- Hypercalcaemia (risk of digitalis toxicity)
- Hypokalaemia (risk of digitalis toxicity; diuretics may predispose to hypokalaemia)
- Hypomagnesaemia (risk of digitalis toxicity)
- Hypoxia (risk of digitalis toxicity)
- Recent myocardial infarction
- Severe respiratory disease
- Sick sinus syndrome
- Thyroid disease
- Constrictive pericarditis
- Renal impairment (reduce dose and monitor plasma-digoxin concentration; toxicity increased by electrolyte disturbances)
- Elderly people (reduce dose)
- Concomitant drug therapy with drugs which may increase plasma concentration of digoxin e.g. amiodarone, antimicrobials, calcium-channel blockers, spironolactone

Adverse effects

The adverse effects of digoxin are frequently due to its narrow therapeutic window and include:

- Cardiac adverse effects
  - Sinoatrial and atrioventricular block
  - Premature ventricular contractions
  - PR prolongation and ST-segment depression
- Nausea, vomiting and diarrhoea
- Blurred or yellow vision
- CNS effects
  - weakness, dizziness, confusion, apathy, malaise, headache, depression, psychosis
- Thrombocytopenia and agranulocytosis (rare)
- Gynaecomastia in men in prolonged administration

Digoxin toxicity

Unwanted effects of digoxin depend on both the plasma concentration of digoxin (increasing risk of toxicity through the range 1.5 – 3 mcg/L) and on the sensitivity of the conducting system or of the myocardium, which is often increased in heart disease. Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Care should also be taken in the elderly who are particularly susceptible to digoxin toxicity.

If toxicity occurs, digoxin should be withdrawn. Digoxin-specific antibody fragments are indicated for the treatment of known or strongly suspected life-threatening digoxin toxicity associated with ventricular arrhythmias or bradyarrhythmias unresponsive to atropine sulfate and when measures beyond the withdrawal of digoxin and correction of any electrolyte abnormalities are considered necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 36 of 121

Which of the following is NOT a common side effect of amiodarone:

a Photosensitivity

b Hyperthyroidism

c Hypothyroidism

d Hepatotoxicity

e Nephrotoxicity

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 36 of 121

Which of the following is NOT a common side effect of amiodarone:

a) Photosensitivity
b) **Hyperthyroidism** ✖
c) Hypothyroidism
d) Hepatotoxicity
e) Nephrotoxicity ✔

Answer

Common side effects of amiodarone include:

- Bradycardia
- Nausea and vomiting
- Thyroid disorders – hypothyroidism and hyperthyroidism
- Persistent slate grey skin discoloration
- Photosensitivity
- Pulmonary toxicity (including pneumonitis and fibrosis)
- Hepatotoxicity
- Corneal microdeposits (sometimes with night glare)
- Peripheral neuropathy
- Sleep disorders

Notes

Amiodarone hydrochloride is used in the treatment of arrhythmias, particularly when other drugs are ineffective or contraindicated. However, its long-term use is often restricted by serious adverse effects such as photosensitivity, thyroid disorders, corneal microdeposits, neuropathy and pulmonary alveolitis.

Mechanism of action

Amiodarone has blocking actions on several channels (e.g. K+ and inactivated Na+ channels) and beta-adrenoceptors. It acts by slowing repolarisation and prolonging the action potential and refractory period in all cardiac tissues, depressing sinus node automaticity and slowing conduction.

Indications

Amiodarone can be used for paroxysmal supraventricular, nodal and ventricular tachycardias, atrial fibrillation and flutter, and ventricular fibrillation. It can also be used for tachyarrhythmias associated with Wolff-Parkinson- White syndrome.

Intravenous injection of amiodarone hydrochloride can be used in cardiopulmonary resuscitation for ventricular fibrillation or pulseless tachycardia unresponsive to other interventions.

Contraindications

Amiodarone is contraindicated in:

- Severe conduction disturbances (unless pacemaker fitted)
- Sinus node disease (unless pacemaker fitted)
- Iodine sensitivity
- Sinoatrial heart block (except in cardiac arrest)
- Sinus bradycardia (except in cardiac arrest)
- Thyroid dysfunction

Intravenous use should be avoided in cardiomyopathy, congestive heart failure, circulatory collapse, severe arterial hypotension and severe respiratory failure.

Cautions

Amiodarone should be used with caution in:

- Acute porphyrias
- Conduction disturbances (in excessive dosage)
- Elderly
- Heart failure
- Hypokalaemia
- Severe bradycardia (in excessive dosage)
- Severe hepatocellular toxicity
- Concomitant therapy with drugs that prolong the QT interval

Adverse effects

Common side effects of amiodarone include:

- Bradycardia
- Nausea and vomiting
- Thyroid disorders – hypothyroidism and hyperthyroidism
- Persistent slate grey skin discoloration
- Photosensitivity
- Pulmonary toxicity (including pneumonitis and fibrosis)
- Hepatotoxicity
- Corneal microdeposits (sometimes with night glare)
- Peripheral neuropathy
- Sleep disorders

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 37 of 121

What is the mechanism of action of clopidogrel:

- a Inhibition of platelet thromboxane A2 synthesis
- b Inhibition of binding of ADP to its platelet receptor
- c Inhibition of GPIIb/IIIa receptor sites
- d Inhibition of the breakdown of cAMP
- e Inhibition of thrombin-induced platelet aggregation

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 37 of 121

What is the mechanism of action of clopidogrel:

a) Inhibition of platelet thromboxane A2 synthesis
b) **Inhibition of binding of ADP to its platelet receptor** ✔
c) Inhibition of GPIIb/IIIa receptor sites
d) Inhibition of the breakdown of cAMP
e) Inhibition of thrombin-induced platelet aggregation

Answer

Clopidogrel, a thienopyridine derivative, inhibits the binding of ADP to its platelet receptor (P2Y12 ADP-receptor), inhibiting platelet adhesion and aggregation.

Notes

Antiplatelet drugs decrease platelet aggregation and inhibit thrombus formation in the arterial circulation, because in faster-flowing vessels, thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Clopidogrel, a thienopyridine derivative, inhibits the binding of ADP to its platelet receptor (P2Y12 ADP-receptor), inhibiting platelet adhesion and aggregation.

Indications

Clopidogrel is used for:

- the prevention of atherothrombotic events in patients with a history of symptomatic ischaemic disease
- the management of ACS (in combination with low-dose aspirin)
- the prevention of atherothrombotic events in percutaneous coronary intervention (in combination with low-dose aspirin)
- the prevention of atherothrombotic and thromboembolic events in patients with atrial fibrillation (who cannot take warfarin) and in stroke (in patients who cannot take aspirin)

Contraindications

Clopidogrel should be avoided in:

- People with active pathological bleeding, such as peptic ulcer or intracranial haemorrhage
- People with severe hepatic impairment
- Women who are pregnant or breastfeeding

Clopidogrel should be used with caution in people who may be at high risk of increased bleeding, for example those receiving treatment with warfarin, other anti-platelets or other drugs known to increase gastrointestinal bleeding (such as NSAIDs, SSRIs and corticosteroids).

Adverse effects

- Clopidogrel is associated with an increased risk of bleeding (for example gastrointestinal bleeds)
- Other common adverse effects include diarrhoea, abdominal pain, and dyspepsia
- Clopidogrel is known to cause pruritus and urticaria, but these adverse reactions are generally uncommon
- Gynaecomastia is a rare adverse effect of clopidogrel
- Thrombotic thrombocytopenic purpura is a very rare adverse effect of clopidogrel, and it sometimes occurs after a short exposure to clopidogrel

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 38 of 121

Mannitol is primarily indicated for which of the following:

a Acute pulmonary oedema

b Cerebral oedema

c Oedema in chronic heart failure

d Hypertension

e Ascites secondary to liver cirrhosis

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 38 of 121

Mannitol is primarily indicated for which of the following:

a) Acute pulmonary oedema
b) **Cerebral oedema** ✔
c) Oedema in chronic heart failure
d) Hypertension
e) Ascites secondary to liver cirrhosis

Answer

Mannitol is an osmotic diuretic that can be used to treat cerebral oedema and raised intraocular pressure.

Notes

Mannitol is an osmotic diuretic that can be used to treat cerebral oedema and raised intraocular pressure.

Mechanism of action

Mannitol is an easily filtered, poorly reabsorbed solute that alters the diffusion of water relative to sodium by 'binding' water. As a result, net reabsorption of Na+ is reduced.

Contraindications

Mannitol is contraindicated in:

- Anuria
- Intracranial bleeding (except during craniotomy)
- Severe cardiac failure
- Severe dehydration
- Severe pulmonary oedema

Adverse effects

Common side effects include:

- Fluid and electrolyte imbalance
- Hypotension
- Thrombophlebitis

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 39 of 121

Which of the following drugs can be used as reversal agent for heparin:

a Hydroxocobalamin

b Protamine sulfate

c Phytomenadione

d Idarucizumab

e Dried prothrombin complex

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 39 of 121

Which of the following drugs can be used as reversal agent for heparin:

a) Hydroxocobalamin
b) **Protamine sulfate** ✔
c) Phytomenadione
d) Idarucizumab
e) Dried prothrombin complex

Answer

If haemorrhage occurs it is usually sufficient to withdraw unfractionated or low molecular weight heparin, but if rapid reversal of the effects of the heparin is required, protamine sulfate is a specific antidote (but only partially reverses the effects of low molecular weight heparins).

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Heparin potentiates the activity of antithrombin III, causing inactivation of thrombin. The heparin-antithrombin III complex also inhibits factor Xa and some other factors. Low molecular weight heparin (LMWH) preparations inhibit only factor Xa. PT and APTT may both be prolonged but the PT less so.

Contraindications

Heparins are contraindicated:

- In people with current (or history of) heparin-induced thrombocytopenia
- In people with acute bacterial endocarditis
- In people with active major bleeding, and conditions with a high risk of uncontrolled bleeding, including recent haemorrhagic stroke, major trauma, recent brain, spinal cord or eye surgery, haemophilia and thrombocytopenia
- In people with active gastric or duodenal ulceration

Adverse effects

- Bleeding
- Heparin-induced thrombocytopenia (immune-mediated effect that usually develops after 5 – 10 days, signs may include a 30% reduction of platelet count, thrombosis, or skin allergy; if HIT is suspected or confirmed, heparin should be discontinued and an alternative anticoagulant given)
- Hyperkalaemia (due to inhibition of aldosterone secretion; patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium or those taking potassium-sparing drugs seem to be more susceptible)
- Osteoporosis (risk lower with LMWH)
- Alopecia
- Hypersensitivity reactions
- Injection site reactions

Low molecular weight heparin vs unfractionated heparin

Unfractionated heparin is usually given by continuous intravenous infusion for the smoothest control and is the treatment of choice where rapid reversal of anticoagulation may be required (e.g. in surgical patients or late pregnancy). Therapy is monitored by maintaining the APTT at 1.5 – 2.5 times the upper limit of normal.

Low molecular weight heparin (LMWH) preparations have largely replaced unfractionated heparin.

Advantages of LMWH
Greater ability to inhibit factor Xa directly, interacting less with platelets and so may have a lesser tendency to cause bleeding
Greater bioavailability and longer half-life in plasma making once daily subcutaneous administration possible
More predictable dose response avoiding the need for routine anticoagulant monitoring
Lower associated risk of heparin-induced thrombocytopenia or of osteoporosis

Haemorrhage

Because it has a short duration of action, if haemorrhage occurs it is usually sufficient to withdraw unfractionated or low molecular weight heparin, but if rapid reversal of the effects of the heparin is required, protamine sulfate is a specific antidote (but only partially reverses the effects of low molecular weight heparins).

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 40 of 121

Which of the following best describes digoxin:

a A positive inotrope and negative chronotrope

b A negative inotrope and positive chronotrope

c A positive inotrope and positive chronotrope

d A negative inotrope and negative chronotrope

e A positive chronotrope with no inotropic effect

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 40 of 121

Which of the following best describes digoxin:

a) **A positive inotrope and negative chronotrope** ✔
b) A negative inotrope and positive chronotrope
c) A positive inotrope and positive chronotrope
d) A negative inotrope and negative chronotrope
e) A positive chronotrope with no inotropic effect

Answer

Digoxin is a cardiac glycoside that increases the force of myocardial contraction (positive inotrope), and slows the heart rate (negative chronotrope).

Notes

Digoxin is a cardiac glycoside that increases the force of myocardial contraction (positive inotrope), and slows the heart rate (negative chronotrope). Digoxin has a narrow therapeutic index; digoxin toxicity can occur even when the serum digoxin concentration is within the therapeutic range (between 0.7 – 2.0 mcg/L).

Mechanism of action

Inotropic effect:

Digoxin inhibits membrane Na+/K+ ATPase, which is responsible for Na+/K+ exchange across the myocyte cell membrane. This increases intracellular Na+ and produces a secondary increase in intracellular Ca2+ that increases the force of myocardial contraction. The increase in intracellular Ca2+ occurs because the decreased Na+ gradient across the membrane reduces the extrusion of Ca2+ by the Na+/Ca2+ exchanger that normally occurs during diastole. Digoxin and K+ ions compete for the receptor on the outside of the muscle cell membrane, and so the effects of digoxin may be dangerously increased in hypokalaemia.

Chronotropic effect:

Digoxin stimulates vagal activity , causing the release of ACh, which slows the heart rate, slows atrioventricular conduction and prolongs the refractory period in the AVN and bundle of His. By delaying AV conduction, digoxin increases the degree of block, and slows and strengthens the ventricular beat.

Indications

Digoxin is most useful for controlling the ventricular response in persistent and permanent atrial fibrillation and atrial flutter. Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation. It is now rarely used for rapid control of heart rate, as even with intravenous administration, response may take many hours.

Digoxin also has a role in the management of heart failure; digoxin improves symptoms of heart failure and exercise tolerance and reduces hospitalisation due to acute exacerbations but it does not reduce mortality. Digoxin is reserved for patients with worsening or severe heart failure due to left ventricular systolic dysfunction refractory to combination therapy with first-line agents.

Contraindications

Digoxin is contraindicated in:

- Supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome
- Ventricular tachycardia or fibrillation
- Heart conduction problems e.g. second degree or intermittent complete heart block
- Hypertrophic cardiomyopathy (unless concomitant atrial fibrillation and heart failure but should be used with caution)

Cautions

Digoxin should be used with caution in:

- Hypercalcaemia (risk of digitalis toxicity)
- Hypokalaemia (risk of digitalis toxicity; diuretics may predispose to hypokalaemia)
- Hypomagnesaemia (risk of digitalis toxicity)
- Hypoxia (risk of digitalis toxicity)
- Recent myocardial infarction
- Severe respiratory disease
- Sick sinus syndrome
- Thyroid disease
- Constrictive pericarditis
- Renal impairment (reduce dose and monitor plasma-digoxin concentration; toxicity increased by electrolyte disturbances)
- Elderly people (reduce dose)
- Concomitant drug therapy with drugs which may increase plasma concentration of digoxin e.g. amiodarone, antimicrobials, calcium-channel blockers, spironolactone

Adverse effects

The adverse effects of digoxin are frequently due to its narrow therapeutic window and include:

- Cardiac adverse effects
  - Sinoatrial and atrioventricular block
  - Premature ventricular contractions
  - PR prolongation and ST-segment depression
- Nausea, vomiting and diarrhoea
- Blurred or yellow vision
- CNS effects
  - weakness, dizziness, confusion, apathy, malaise, headache, depression, psychosis
- Thrombocytopenia and agranulocytosis (rare)
- Gynaecomastia in men in prolonged administration

Digoxin toxicity

Unwanted effects of digoxin depend on both the plasma concentration of digoxin (increasing risk of toxicity through the range 1.5 – 3 mcg/L) and on the sensitivity of the conducting system or of the myocardium, which is often increased in heart disease. Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Care should also be taken in the elderly who are particularly susceptible to digoxin toxicity.

If toxicity occurs, digoxin should be withdrawn. Digoxin-specific antibody fragments are indicated for the treatment of known or strongly suspected life-threatening digoxin toxicity associated with ventricular arrhythmias or bradyarrhythmias unresponsive to atropine sulfate and when measures beyond the withdrawal of digoxin and correction of any electrolyte abnormalities are considered necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 41 of 121

Which of the following is NOT an adverse effect of furosemide:

a Hyperglycaemia

b Gout

c Ototoxicity

d Urinary retention

e Metabolic acidosis

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 41 of 121

Which of the following is NOT an adverse effect of furosemide:

a) Hyperglycaemia
b) Gout
c) Ototoxicity
d) **Urinary retention** ✗
e) Metabolic acidosis ✓

Answer

Adverse effects of loop diuretics include:

- Mild gastrointestinal disturbances, pancreatitis and hepatic encephalopathy
- Hyperglycaemia
- Acute urinary retention
- Water and electrolyte imbalance
  - Hyponatraemia, hypocalcaemia, hypokalaemia, hypomagnesaemia, hypochloraemia
- Hypotension, hypovolaemia, dehydration, and venous thromboembolism
- Metabolic alkalosis
- Hyperuricaemia
- Blood disorders (bone marrow suppression, thrombocytopenia, and leucopenia)
- Visual disturbance, tinnitus and deafness
- Hypersensitivity reactions

Notes

Indications

Loop diuretics are powerful diuretics used in acute pulmonary oedema due to left ventricular failure; intravenous administration produces relief of breathlessness and reduces preload sooner than would be expected from the time of onset of diuresis.

They are also used in oedema in patients with chronic heart failure; diuretic-resistant oedema can be treated with a loop diuretic combined with a thiazide or related diuretic.

If necessary, a loop diuretic can be added to antihypertensive treatment to achieve better control of blood pressure in those with resistant hypertension, or in patients with impaired renal function or heart failure.

Mechanism of action

Loop diuretics inhibit the Na+/K+/2Cl- symporter on the luminal membrane in the thick ascending limb of the loop of Henle, thus preventing reabsorption of NaCl and water. These agents reduce reabsorption of Cl- and Na+ and increase Ca2+ excretion and loss of K+ and Mg2+.

Furosemide and bumetanide are similar in activity; both act within 1 hour of oral administration and diuresis is complete within 6 hours so that, if necessary, they can be given twice in one day without interfering with sleep. Following intravenous administration furosemide has a peak effect within 30 minutes. The diuresis associated with these drugs is dose related.

Contraindications

Loop diuretics are contraindicated in:

- Hypovolaemia and dehydration
- Severe hypokalaemia or severe hyponatraemia
- Anuria, acute kidney injury or chronic kidney disease due to nephrotoxic drugs
- Comatose and pre-comatose states associated with liver cirrhosis

Cautions

Loop diuretics can exacerbate diabetes (but hyperglycaemia is less likely than with thiazides) and gout.

If there is an enlarged prostate, urinary retention can occur, although this is less likely if small doses and less potent diuretics are used initially.

Hypotension, hypovolaemia and electrolyte disturbance should be corrected before initiation of treatment.

Hepatorenal syndrome; hypoproteinaemia may reduce diuretic effect and increase risk of side-effects.

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects.

Adverse effects

Adverse effects of loop diuretics include:

- Mild gastrointestinal disturbances, pancreatitis and hepatic encephalopathy
- Hyperglycaemia
- Acute urinary retention
- Water and electrolyte imbalance
  - Hyponatraemia, hypocalcaemia, hypokalaemia, hypomagnesaemia, hypochloraemia
- Hypotension, hypovolaemia, dehydration, and venous thromboembolism
- Metabolic alkalosis
- Hyperuricaemia
- Blood disorders (bone marrow suppression, thrombocytopenia, and leucopenia)
- Visual disturbance, tinnitus and deafness
- Hypersensitivity reactions

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic.

Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements. In hepatic failure, hypokalaemia caused by diuretics can precipitate encephalopathy, particularly in alcoholic cirrhosis.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 42 of 121

Which of the following best describes verapamil:

a Negative inotrope, positive chronotrope

b Positive inotrope, negative chronotrope

c Positive inotrope, positive chronotrope

d Negative inotrope, negative chronotrope

e Negative inotrope, no chronotropic effect

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 42 of 121

Which of the following best describes verapamil:

a) Negative inotrope, positive chronotrope
b) Positive inotrope, negative chronotrope
c) Positive inotrope, positive chronotrope
d) Negative inotrope, negative chronotrope ✔
e) **Negative inotrope, no chronotropic effect** ✖

Answer

Verapamil is used for the treatment of angina, hypertension, and arrhythmias. Verapamil is highly negatively inotropic and reduces cardiac output, slows the heart rate and may impair atrioventricular conduction. It may precipitate heart failure, exacerbate conduction disorders, and cause hypotension at high doses and should not be used with beta-blockers. Constipation is the most common side effect.

Notes

Calcium channel blockers are widely used in the treatment of angina (second line to beta-blockers) and also for hypertension, heart failure and arrhythmias.

Calcium channel blockers vary widely in their predilection for the various possible sites of action and in their therapeutic effects and may be divided into the dihydropyridine type (e.g. amlodipine, nifedipine and nimodipine) and the rate-limiting non-dihydropyridine type (e.g. verapamil, diltiazem).

Mechanism of action

Calcium channel blockers inhibit L-type voltage-sensitive calcium channels in arterial smooth muscle, causing relaxation and vasodilation. They also block calcium channels within the myocardium and conducting tissues of the heart which produces a negative inotropic effect by reducing calcium influx during the plateau phase of the action potential.

The dihydropyridines have relatively little effect on the heart because they have a much higher affinity for inactivated channels found more frequently in vascular muscle. Furthermore, at clinical doses, vasodilation results in a reflex increase in sympathetic tone that counteracts the mild negative inotropic effect. The non-dihydropyridines are rate-limiting calcium-channel blockers that depress the sinus node and slow conduction in the atrioventricular node, causing a mild resting bradycardia.

Contraindications

Non-dihydropyridine CCBs:

- Atrial flutter or fibrillation
- Heart failure or history of heart failure (may precipitate or aggravate symptoms)
- Cardiac outflow obstruction e.g. significant aortic stenosis or obstructive hypertrophic cardiomyopathy (vasodilation may result in reduced cardiac output)
- Second or third degree AV block (may induce complete AV block)
- Severe bradycardia
- Sick sinus syndrome

Dihydropyridine CCBs:

- Uncontrolled heart failure
- Severe hypotension
- Cardiac outflow obstruction

Adverse effects

- Gastrointestinal adverse effects – constipation, nausea, dyspepsia
- Bradycardia, AV block, reflex tachycardia, palpitations
- Vasodilatory adverse effects – flushing, dizziness, headache, postural hypotension, ankle swelling (more common with dihydropyridine calcium-channel blockers and often improve with continued use, although ankle swelling often persists)
- Gingival hyperplasia
- Malaise and fatigue
- Myalgia and arthralgia

Verapamil

Verapamil is used for the treatment of angina, hypertension, and arrhythmias. Verapamil is highly negatively inotropic and reduces cardiac output, slows the heart rate and may impair atrioventricular conduction. It may precipitate heart failure, exacerbate conduction disorders, and cause hypotension at high doses and should not be used with beta-blockers. Constipation is the most common side effect.

Nifedipine

Nifedipine relaxes vascular smooth muscle and dilates coronary and peripheral arteries. Nifedipine has less myocardial effects than verapamil and has no antiarrhythmic properties but has more influence on the vessels. Unlike verapamil it rarely precipitates heart failure because any negative inotropic effect is offset by a reduction in left ventricular work.

Nimodipine

Nimodipine is related to nifedipine but the smooth muscle relaxant effects preferentially act on cerebral arteries. It is used solely for the prevention and treatment of vascular spasm following aneurysmal subarachnoid haemorrhage.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 43 of 121

Thiazide diuretics are primarily indicated for which of the following:

a Acute pulmonary oedema

b Cerebral oedema

c Oedema in chronic heart failure

d Acute angle-closure glaucoma

e Ascites secondary to liver cirrhosis

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 43 of 121

Thiazide diuretics are primarily indicated for which of the following:

a) Acute pulmonary oedema
b) Cerebral oedema
c) **Oedema in chronic heart failure** ✔
d) Acute angle-closure glaucoma
e) Ascites secondary to liver cirrhosis

Answer

Thiazide diuretics are moderately potent diuretics, and are used to relieve oedema in chronic heart failure, and in the management of hypertension. They act within 1 to 2 hours of oral administration and most have a duration of action of 12 to 24 hours.

Notes

Thiazide diuretics are moderately potent diuretics, and are used to relieve oedema in chronic heart failure, and in the management of hypertension. They act within 1 to 2 hours of oral administration and most have a duration of action of 12 to 24 hours.

Mechanism of action

Thiazides act mainly on the early segments of distal tubule where they inhibit NaCl reabsorption by binding to the the Na+/Cl- cotransporter. Excretion of Cl-, Na+ and accompanying water is increased. The increased Na+ load in the distal tubule stimulates Na+ exchange with K+ and H+, increasing their excretion and causing hypokalaemia and a metabolic alkalosis. Excretion of Ca2+ is reduced.

Indications

Bendroflumethiazide is used for oedema in mild or moderate heart failure. Combination diuretic therapy (with loop and thiazide diuretics) may be effective in patients with oedema resistant to treatment with one diuretic.

Thiazide diuretics are licensed for the treatment of hypertension but are no longer considered the first line diuretic for this indication. In the management of hypertension a low dose of a thiazide produces a maximal or near-maximal blood pressure lowering effect, with very little biochemical disturbance. Higher doses cause more marked changes in plasma potassium, sodium, uric acid, glucose, and lipids, with little advantage in blood pressure control.

Contraindications

Thiazide diuretics are contraindicated in:

- Addison's disease
- Hypercalcaemia
- Hyponatraemia
- Refractory hypokalaemia
- Symptomatic hyperuricaemia
- Severe hepatic impairment (may precipitate encephalopathy)

Cautions

Thiazide diuretics should be used with caution in:

- Diabetes mellitus (may exacerbate)
- Gout (may exacerbate)
- Systemic lupus erythematosus (may exacerbate)
- Hyperaldosteronism
- Malnourishment
- Nephrotic syndrome

Adverse effects

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects. The dose should then be adjusted according to renal function.

Common side effects of thiazide diuretics include:

- Excessive diuresis
  - Postural hypotension, dehydration, renal impairment
- Acid-base and electrolyte imbalance
  - Hypokalaemia, hyponatraemia, hypomagnesaemia, hypercalcaemia, hypochloraemic alkalosis
- Metabolic imbalance
  - Hyperuricaemia and gout
  - Impaired glucose tolerance and hyperglycaemia
  - Altered plasma-lipid concentrations
- Mild gastrointestinal disturbances

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic. Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 44 of 121

Regarding warfarin, which of the following statements is CORRECT:

a Warfarin takes 24 hours for the full anticoagulant effect to develop.

b Warfarin is monitored by the activated partial thromboplastin time (aPTT) reported as the INR.

c Warfarin potentiates the activity of antithrombin and impairs platelet function.

d Warfarin should be reversed if the INR > 8.0 regardless of any bleeding.

e Warfarin can be safely used in pregnancy.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 44 of 121

Regarding warfarin, which of the following statements is CORRECT:

a) Warfarin takes 24 hours for the full anticoagulant effect to develop.
b) Warfarin is monitored by the activated partial thromboplastin time (aPTT) reported as the INR.
c) **Warfarin potentiates the activity of antithrombin and impairs platelet function.** ✖
d) Warfarin should be reversed if the INR > 8.0 regardless of any bleeding. ✔
e) Warfarin can be safely used in pregnancy.

Answer

Warfarin may need to be omitted for a couple of doses if the INR rises above the target range or even reversed if the INR is > 8.0 or there are signs of bleeding. Warfarin is contraindicated in pregnancy. Warfarin antagonists the effects of vitamin K and inhibits the activity of vitamin-K dependent clotting factors (factors VII, IX, X and II) and of protein C and S. Warfarin takes at least 48 to 72 hours for the anticoagulant effect to develop. Warfarin is monitored using the prothrombin time (PT) reported as the INR.

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Warfarin is a vitamin K antagonist and will reduce the activity of vitamin-K dependent clotting factors (factors VII, IX, X and II) and of protein C and S.

Both the PT and APTT are usually prolonged but the PT is grossly prolonged and the APTT only mildly.

Indications

Warfarin is licensed for:

- Prophylaxis of systemic embolism in people with rheumatic heart disease and atrial fibrillation
- Prophylaxis after insertion of prosthetic heart valves
- Prophylaxis and treatment of venous thrombosis and pulmonary embolism
- Transient attacks of cerebral ischaemia

Warfarin takes at least 48 to 72 hours for the anticoagulant effect to develop and if an immediate effect is required, heparin must be given concomitantly and continued for at least 5 days and until the INR is greater or equal to 2.0 for more than 24 hours. The duration of treatment is dependent on the indication.

Contraindications

- Haemorrhagic stroke
- Clinically significant bleeding
- Within 72 hours of major surgery with risk of severe bleeding
- Within 48 hours postpartum
- Pregnancy
- Untreated bleeding disorders for example, thrombocytopenia, haemophilia, liver failure and renal failure
- Potential bleeding lesions for example; active peptic ulcer; oesophageal varices; aneurysm; proliferative retinopathy; recent organ biopsy; recent trauma or surgery to head, orbit, or spine; recent stroke; confirmed intracranial or intraspinal bleed

Cautions

Warfarin should be used with caution in any patient at increased risk of haemorrhage with risk factors including:

- People aged over 65 years
- Previous bleeding episode, history of gastrointestinal bleeding or anaemia
- Recent ischaemic stroke, hypertension, heart disease, cerebrovascular disease, renal disease, liver disease, active peptic ulcer
- Recent or imminent surgery or trauma
- Excessive alcohol intake, frequent or significant falls
- Regular use of NSAIDs or other drugs that increase risk of bleeding

Adverse effects

- The most common adverse effect of warfarin is bleeding
- Other common adverse effects of warfarin include nausea, vomiting, diarrhoea, jaundice, hepatic dysfunction, pancreatitis, pyrexia, alopecia, purpura, and rash
- Skin necrosis is a rare but serious adverse effect of warfarin; treatment with warfarin should be stopped if warfarin related skin necrosis is suspected
- Calciphylaxis is a rare, but a very serious condition that causes vascular calcification and cutaneous necrosis

Monitoring

The prothrombin time, reported as the INR is used to monitor warfarin therapy; the target INR is dependent on the indication.

Warfarin may need to be omitted for a couple of doses if the INR rises above the target range or even reversed if the INR is > 8.0 or there are signs of bleeding. Phytomenadione (vitamin K) can be given as a specific antidote to warfarin or in cases of major bleeding, dried prothrombin complex (factors II, VII, IX, and X); if dried prothrombin complex is unavailable, fresh frozen plasma can be given but is less effective.

Scenario	Management
INR 5.0 – 8.0, no bleeding	Withhold 1 – 2 doses of warfarin and reduce subsequent maintenance dose
INR 5.0 – 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, restart warfarin when INR < 5.0
INR > 8.0, no bleeding	Stop warfarin, give phytomenadione orally, restart warfarin when INR < 5.0
INR > 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, repeat dose if INR still too high after 24 h, restart warfarin when INR < 5.0
Major bleeding	Stop warfarin, give phytomenadione intravenously, give dried prothrombin complex

Drug interactions

Increased anticoagulant effect	Decreased anticoagulant effect
Alcohol	Tricyclic antidepressants
Amiodarone	St John's wort
Antibiotics(co-trimoxazole, metronidazole, quinolones, macrolides)	Vitamin K-containing vitamin complexes, some enteral feeds, mineral supplements, and green vegetables
Antidepressants (SSRIs, SNRIs, TCAs)	Rifampicin
Azoles	Carbamazepine
Cranberry juice	Phenobarbital
Corticosteroids	Primidone
Fibrates	Azathioprine
NSAIDs	Phenytoin
Thyroxine	Griseofulvin

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

< Previous | Next >

Something wrong?

Pharmacology: Cardiovascular

Question 45 of 121

Which of the following is an adverse effect of statin therapy:

a Nephrotoxicity

b Myositis

c Ototoxicity

d Hypoglycaemia

e Megaloblastic anaemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 45 of 121

Which of the following is an adverse effect of statin therapy:

a) Nephrotoxicity
b) **Myositis** ✔
c) Ototoxicity
d) Hypoglycaemia
e) Megaloblastic anaemia

Answer

The risk of myopathy, myositis, and rhabdomyolysis associated with statin use is rare. Although myalgia has been reported commonly in patients receiving statins, muscle toxicity truly attributable to statin use is rare.

Muscle toxicity can occur with all statins, however the likelihood increases with higher doses and in certain patients. Statins should be used with caution in patients at increased risk of muscle toxicity, including those with a personal or family history of muscular disorders, previous history of muscular toxicity, a high alcohol intake, renal impairment or hypothyroidism.

Notes

Statins may be used for primary or secondary prevention of cardiovascular disease and for treatment of primary or familial hypercholesterolaemia.

Statins are more effective than other lipid-regulating drugs at lowering LDL-cholesterol concentration but they are less effective than the fibrates in reducing triglyceride concentration. However, statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Mechanism of action

Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase, an enzyme involved in cholesterol synthesis. Inhibition of HMG CoA reductase reduces low-density lipoprotein (LDL) cholesterol levels by slowing down the production of cholesterol in the liver and increasing the liver's ability to remove the LDL cholesterol already in the blood.

Indications

Statins should be offered to all patients, including the elderly, with cardiovascular disease such as those with coronary heart disease (including history of angina or acute myocardial infarction) or occlusive arterial disease (including peripheral vascular disease, non-haemorrhagic stroke, or transient ischaemic attacks). The use of statins should be considered in patients with a high risk of developing cardiovascular disease (primary prevention) which can be assessed using risk calculators.

Contraindications

Statins should be avoided in:

- People with active liver disease
- People with transaminase (alanine aminotransferase or aspartate aminotransferase) levels that are three or more times the upper limit of normal
- Pregnant or breastfeeding women (discontinue 3 months before attempting to conceive)

Cautions

Statins should be used with caution in people:

- With a history of liver disease
- Who consume high level of alcohol
- With predisposing factors for rhabdomyolysis such as older age (> 70 years), concomitant use with an interacting drug, renal impairment, hypothyroidism, and personal or familial history of hereditary muscular disorders

Adverse effects

Adverse effects of statins include:

- Headache
- Epistaxis
- Gastrointestinal disorders (such as constipation, flatulence, dyspepsia, nausea, and diarrhoea)
- Musculoskeletal and connective tissue disorders (such as myalgia, arthralgia, pain in the extremity, muscle spasms, joint swelling, and back pain)
- Hyperglycaemia and diabetes
- Myopathy and rhabdomyolysis
- Interstitial lung disease
- Hepatotoxicity

Muscle effects

The risk of myopathy, myositis, and rhabdomyolysis associated with statin use is rare. Although myalgia has been reported commonly in patients receiving statins, muscle toxicity truly attributable to statin use is rare.

Muscle toxicity can occur with all statins, however the likelihood increases with higher doses and in certain patients. Statins should be used with caution in patients at increased risk of muscle toxicity, including those with a personal or family history of muscular disorders, previous history of muscular toxicity, a high alcohol intake, renal impairment or hypothyroidism.

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 46 of 121

What is the mechanism of action of warfarin:

a Blocks GPIIb/IIIa receptor sites

b Directly inhibits factor Xa

c Inhibits free thrombin, fibrin-bound thrombin, and thrombin-induced platelet aggregation

d Inhibits vitamin K dependent clotting factors

e Inhibits cyclo-oxygenase

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 46 of 121

What is the mechanism of action of warfarin:

a) Blocks GPIIb/IIIa receptor sites
b) Directly inhibits factor Xa
c) Inhibits free thrombin, fibrin-bound thrombin, and thrombin-induced platelet aggregation
d) **Inhibits vitamin K dependent clotting factors** ✔
e) Inhibits cyclo-oxygenase

Answer

Warfarin is a vitamin K antagonist and will reduce the activity of vitamin-K dependent clotting factors (factors VII, IX, X and II) and of protein C and S.

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Warfarin is a vitamin K antagonist and will reduce the activity of vitamin-K dependent clotting factors (factors VII, IX, X and II) and of protein C and S.

Both the PT and APTT are usually prolonged but the PT is grossly prolonged and the APTT only mildly.

Indications

Warfarin is licensed for:

- Prophylaxis of systemic embolism in people with rheumatic heart disease and atrial fibrillation
- Prophylaxis after insertion of prosthetic heart valves
- Prophylaxis and treatment of venous thrombosis and pulmonary embolism
- Transient attacks of cerebral ischaemia

Warfarin takes at least 48 to 72 hours for the anticoagulant effect to develop and if an immediate effect is required, heparin must be given concomitantly and continued for at least 5 days and until the INR is greater or equal to 2.0 for more than 24 hours. The duration of treatment is dependent on the indication.

Contraindications

- Haemorrhagic stroke
- Clinically significant bleeding
- Within 72 hours of major surgery with risk of severe bleeding
- Within 48 hours postpartum
- Pregnancy
- Untreated bleeding disorders for example, thrombocytopenia, haemophilia, liver failure and renal failure
- Potential bleeding lesions for example; active peptic ulcer; oesophageal varices; aneurysm; proliferative retinopathy; recent organ biopsy; recent trauma or surgery to head, orbit, or spine; recent stroke; confirmed intracranial or intraspinal bleed

Cautions

Warfarin should be used with caution in any patient at increased risk of haemorrhage with risk factors including:

- People aged over 65 years
- Previous bleeding episode, history of gastrointestinal bleeding or anaemia
- Recent ischaemic stroke, hypertension, heart disease, cerebrovascular disease, renal disease, liver disease, active peptic ulcer
- Recent or imminent surgery or trauma
- Excessive alcohol intake, frequent or significant falls
- Regular use of NSAIDs or other drugs that increase risk of bleeding

Adverse effects

- The most common adverse effect of warfarin is bleeding
- Other common adverse effects of warfarin include nausea, vomiting, diarrhoea, jaundice, hepatic dysfunction, pancreatitis, pyrexia, alopecia, purpura, and rash
- Skin necrosis is a rare but serious adverse effect of warfarin; treatment with warfarin should be stopped if warfarin related skin necrosis is suspected
- Calciphylaxis is a rare, but a very serious condition that causes vascular calcification and cutaneous necrosis

Monitoring

The prothrombin time, reported as the INR is used to monitor warfarin therapy; the target INR is dependent on the indication.

Warfarin may need to be omitted for a couple of doses if the INR rises above the target range or even reversed if the INR is > 8.0 or there are signs of bleeding. Phytomenadione (vitamin K) can be given as a specific antidote to warfarin or in cases of major bleeding, dried prothrombin complex (factors II, VII, IX, and X); if dried prothrombin complex is unavailable, fresh frozen plasma can be given but is less effective.

Scenario	Management
INR 5.0 – 8.0, no bleeding	Withhold 1 – 2 doses of warfarin and reduce subsequent maintenance dose
INR 5.0 – 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, restart warfarin when INR < 5.0
INR > 8.0, no bleeding	Stop warfarin, give phytomenadione orally, restart warfarin when INR < 5.0
INR > 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, repeat dose if INR still too high after 24 h, restart warfarin when INR < 5.0
Major bleeding	Stop warfarin, give phytomenadione intravenously, give dried prothrombin complex

Drug interactions

Increased anticoagulant effect	Decreased anticoagulant effect
Alcohol	Tricyclic antidepressants
Amiodarone	St John's wort
Antibiotics(co-trimoxazole, metronidazole, quinolones, macrolides)	Vitamin K-containing vitamin complexes, some enteral feeds, mineral supplements, and green vegetables
Antidepressants (SSRIs, SNRIs, TCAs)	Rifampicin
Azoles	Carbamazepine
Cranberry juice	Phenobarbital
Corticosteroids	Primidone
Fibrates	Azathioprine
NSAIDs	Phenytoin
Thyroxine	Griseofulvin

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 47 of 121

Which of the following is NOT an adverse effect associated with heparin therapy:

a Osteoporosis

b Alopecia

c Hyperkalaemia

d Thrombocytopenia

e Teratogenicity

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 47 of 121

Which of the following is NOT an adverse effect associated with heparin therapy:

a) Osteoporosis
b) Alopecia
c) **Hyperkalaemia** ✖
d) Thrombocytopenia
e) Teratogenicity ✔

Answer

Heparin does not cross the placenta and is safe to be used in pregnancy, unlike warfarin.

Adverse effects of heparin include:

- Bleeding
- Heparin-induced thrombocytopenia (immune-mediated effect that usually develops after 5 – 10 days, signs may include a 30% reduction of platelet count, thrombosis, or skin allergy; if HIT is suspected or confirmed, heparin should be discontinued and an alternative anticoagulant given)
- Hyperkalaemia (due to inhibition of aldosterone secretion; patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium or those taking potassium-sparing drugs seem to be more susceptible)
- Osteoporosis (risk lower with LMWH)
- Alopecia
- Hypersensitivity reactions
- Injection site reactions

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Heparin potentiates the activity of antithrombin III, causing inactivation of thrombin. The heparin-antithrombin III complex also inhibits factor Xa and some other factors. Low molecular weight heparin (LMWH) preparations inhibit only factor Xa. PT and APTT may both be prolonged but the PT less so.

Contraindications

Heparins are contraindicated:

- In people with current (or history of) heparin-induced thrombocytopenia
- In people with acute bacterial endocarditis
- In people with active major bleeding, and conditions with a high risk of uncontrolled bleeding, including recent haemorrhagic stroke, major trauma, recent brain, spinal cord or eye surgery, haemophilia and thrombocytopenia
- In people with active gastric or duodenal ulceration

Adverse effects

- Bleeding
- Heparin-induced thrombocytopenia (immune-mediated effect that usually develops after 5 – 10 days, signs may include a 30% reduction of platelet count, thrombosis, or skin allergy; if HIT is suspected or confirmed, heparin should be discontinued and an alternative anticoagulant given)
- Hyperkalaemia (due to inhibition of aldosterone secretion; patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium or those taking potassium-sparing drugs seem to be more susceptible)
- Osteoporosis (risk lower with LMWH)
- Alopecia
- Hypersensitivity reactions
- Injection site reactions

Low molecular weight heparin vs unfractionated heparin

Unfractionated heparin is usually given by continuous intravenous infusion for the smoothest control and is the treatment of choice where rapid reversal of anticoagulation may be required (e.g. in surgical patients or late pregnancy). Therapy is monitored by maintaining the APTT at 1.5 – 2.5 times the upper limit of normal.

Low molecular weight heparin (LMWH) preparations have largely replaced unfractionated heparin.

Advantages of LMWH
Greater ability to inhibit factor Xa directly, interacting less with platelets and so may have a lesser tendency to cause bleeding
Greater bioavailability and longer half-life in plasma making once daily subcutaneous administration possible
More predictable dose response avoiding the need for routine anticoagulant monitoring
Lower associated risk of heparin-induced thrombocytopenia or of osteoporosis

Haemorrhage

Because it has a short duration of action, if haemorrhage occurs it is usually sufficient to withdraw unfractionated or low molecular weight heparin, but if rapid reversal of the effects of the heparin is required, protamine sulfate is a specific antidote (but only partially reverses the effects of low molecular weight heparins).

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 48 of 121

Which of the following drugs may reduce the anticoagulant effect of warfarin:

a Alcohol

b Phenytoin

c NSAIDs

d Metronidazole

e Thyroxine

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 48 of 121

Which of the following drugs may reduce the anticoagulant effect of warfarin:

a) Alcohol
b) Phenytoin ✔
c) NSAIDs ✖
d) Metronidazole
e) Thyroxine

Answer

Increased anticoagulant effect	Decreased anticoagulant effect
Alcohol	Tricyclic antidepressants
Amiodarone	St John's wort
Antibiotics(co-trimoxazole, metronidazole, quinolones, macrolides)	Vitamin K-containing vitamin complexes, some enteral feeds, mineral supplements, and green vegetables
Antidepressants (SSRIs, SNRIs, TCAs)	Rifampicin
Azoles	Carbamazepine
Cranberry juice	Phenobarbital
Corticosteroids	Primidone
Fibrates	Azathioprine
NSAIDs	Phenytoin
Thyroxine	Griseofulvin

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Warfarin is a vitamin K antagonist and will reduce the activity of vitamin-K dependent clotting factors (factors VII, IX, X and II) and of protein C and S.

Both the PT and APTT are usually prolonged but the PT is grossly prolonged and the APTT only mildly.

Indications

Warfarin is licensed for:

- Prophylaxis of systemic embolism in people with rheumatic heart disease and atrial fibrillation
- Prophylaxis after insertion of prosthetic heart valves
- Prophylaxis and treatment of venous thrombosis and pulmonary embolism
- Transient attacks of cerebral ischaemia

Warfarin takes at least 48 to 72 hours for the anticoagulant effect to develop and if an immediate effect is required, heparin must be given concomitantly and continued for at least 5 days and until the INR is greater or equal to 2.0 for more than 24 hours. The duration of treatment is dependent on the indication.

Contraindications

- Haemorrhagic stroke
- Clinically significant bleeding
- Within 72 hours of major surgery with risk of severe bleeding
- Within 48 hours postpartum
- Pregnancy
- Untreated bleeding disorders for example, thrombocytopenia, haemophilia, liver failure and renal failure
- Potential bleeding lesions for example; active peptic ulcer; oesophageal varices; aneurysm; proliferative retinopathy; recent organ biopsy; recent trauma or surgery to head, orbit, or spine; recent stroke; confirmed intracranial or intraspinal bleed

Cautions

Warfarin should be used with caution in any patient at increased risk of haemorrhage with risk factors including:

- People aged over 65 years
- Previous bleeding episode, history of gastrointestinal bleeding or anaemia
- Recent ischaemic stroke, hypertension, heart disease, cerebrovascular disease, renal disease, liver disease, active peptic ulcer
- Recent or imminent surgery or trauma
- Excessive alcohol intake, frequent or significant falls
- Regular use of NSAIDs or other drugs that increase risk of bleeding

Adverse effects

- The most common adverse effect of warfarin is bleeding
- Other common adverse effects of warfarin include nausea, vomiting, diarrhoea, jaundice, hepatic dysfunction, pancreatitis, pyrexia, alopecia, purpura, and rash
- Skin necrosis is a rare but serious adverse effect of warfarin; treatment with warfarin should be stopped if warfarin related skin necrosis is suspected
- Calciphylaxis is a rare, but a very serious condition that causes vascular calcification and cutaneous necrosis

Monitoring

The prothrombin time, reported as the INR is used to monitor warfarin therapy; the target INR is dependent on the indication.

Warfarin may need to be omitted for a couple of doses if the INR rises above the target range or even reversed if the INR is > 8.0 or there are signs of bleeding. Phytomenadione (vitamin K) can be given as a specific antidote to warfarin or in cases of major bleeding, dried prothrombin complex (factors II, VII, IX, and X); if dried prothrombin complex is unavailable, fresh frozen plasma can be given but is less effective.

Scenario	Management
INR 5.0 – 8.0, no bleeding	Withhold 1 – 2 doses of warfarin and reduce subsequent maintenance dose
INR 5.0 – 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, restart warfarin when INR < 5.0
INR > 8.0, no bleeding	Stop warfarin, give phytomenadione orally, restart warfarin when INR < 5.0
INR > 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, repeat dose if INR still too high after 24 h, restart warfarin when INR < 5.0
Major bleeding	Stop warfarin, give phytomenadione intravenously, give dried prothrombin complex

Drug interactions

Increased anticoagulant effect	Decreased anticoagulant effect
Alcohol	Tricyclic antidepressants
Amiodarone	St John's wort
Antibiotics(co-trimoxazole, metronidazole, quinolones, macrolides)	Vitamin K-containing vitamin complexes, some enteral feeds, mineral supplements, and green vegetables
Antidepressants (SSRIs, SNRIs, TCAs)	Rifampicin
Azoles	Carbamazepine
Cranberry juice	Phenobarbital
Corticosteroids	Primidone
Fibrates	Azathioprine
NSAIDs	Phenytoin
Thyroxine	Griseofulvin

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 49 of 121

What is the first line alternative if adenosine is contraindicated in the management of a stable narrow-complex tachycardia:

a Amiodarone

b Verapamil

c Digoxin

d Magnesium sulfate

e Bisoprolol

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 49 of 121

What is the first line alternative if adenosine is contraindicated in the management of a stable narrow-complex tachycardia:

a) Amiodarone ✗
b) Verapamil ✓
c) Digoxin
d) Magnesium sulfate
e) Bisoprolol

Answer

The first step in treatment of regular narrow-complex tachycardias is to attempt vagal manoeuvres (carotid sinus massage or Valsalva manoeuvre). If the tachyarrhythmia persists, adenosine 6 mg IV should be given as a rapid bolus using a large cannula and a large vein. If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 50 of 121

What is the mechanism of action of bendroflumethiazide:

a Inhibition of Na+/K+/2Cl cotransporter

b Inhibition of Na+/Cl- cotransporter

c Aldosterone antagonist

d Carbonic anhydrase inhibitor

e Inhibition of Na+/K+ ATPase pump

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 50 of 121

What is the mechanism of action of bendroflumethiazide:

a) **Inhibition of Na+/K+/2Cl cotransporter** ✗
b) Inhibition of Na+/Cl- cotransporter ✓
c) Aldosterone antagonist
d) Carbonic anhydrase inhibitor
e) Inhibition of Na+/K+ ATPase pump

Answer

Thiazides act mainly on the early segments of distal tubule where they inhibit NaCl reabsorption by binding to the the Na+/Cl- cotransporter. Excretion of Cl-, Na+ and accompanying water is increased. The increased Na+ load in the distal tubule stimulates Na+ exchange with K+ and H+, increasing their excretion and causing hypokalaemia and a metabolic alkalosis. Excretion of Ca2+ is reduced.

Notes

Thiazide diuretics are moderately potent diuretics, and are used to relieve oedema in chronic heart failure, and in the management of hypertension. They act within 1 to 2 hours of oral administration and most have a duration of action of 12 to 24 hours.

Mechanism of action

Thiazides act mainly on the early segments of distal tubule where they inhibit NaCl reabsorption by binding to the the Na+/Cl- cotransporter. Excretion of Cl-, Na+ and accompanying water is increased. The increased Na+ load in the distal tubule stimulates Na+ exchange with K+ and H+, increasing their excretion and causing hypokalaemia and a metabolic alkalosis. Excretion of Ca2+ is reduced.

Indications

Bendroflumethiazide is used for oedema in mild or moderate heart failure. Combination diuretic therapy (with loop and thiazide diuretics) may be effective in patients with oedema resistant to treatment with one diuretic.

Thiazide diuretics are licensed for the treatment of hypertension but are no longer considered the first line diuretic for this indication. In the management of hypertension a low dose of a thiazide produces a maximal or near-maximal blood pressure lowering effect, with very little biochemical disturbance. Higher doses cause more marked changes in plasma potassium, sodium, uric acid, glucose, and lipids, with little advantage in blood pressure control.

Contraindications

Thiazide diuretics are contraindicated in:

- Addison's disease
- Hypercalcaemia
- Hyponatraemia
- Refractory hypokalaemia
- Symptomatic hyperuricaemia
- Severe hepatic impairment (may precipitate encephalopathy)

Cautions

Thiazide diuretics should be used with caution in:

- Diabetes mellitus (may exacerbate)
- Gout (may exacerbate)
- Systemic lupus erythematosus (may exacerbate)
- Hyperaldosteronism
- Malnourishment
- Nephrotic syndrome

Adverse effects

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects. The dose should then be adjusted according to renal function.

Common side effects of thiazide diuretics include:

- Excessive diuresis
  - Postural hypotension, dehydration, renal impairment
- Acid-base and electrolyte imbalance
  - Hypokalaemia, hyponatraemia, hypomagnesaemia, hypercalcaemia, hypochloraemic alkalosis
- Metabolic imbalance
  - Hyperuricaemia and gout
  - Impaired glucose tolerance and hyperglycaemia
  - Altered plasma-lipid concentrations
- Mild gastrointestinal disturbances

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic. Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 51 of 121

What is the mechanism of action of captopril:

a Inhibition of inactivated Na+ channels

b Angiotensin II receptor blocker

c Angiotensin-converting enzyme inhibitor

d Acetylcholinesterase inhibitor

e Alpha-blocker

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 51 of 121

What is the mechanism of action of captopril:

a) **Inhibition of inactivated Na+ channels** ✗
b) Angiotensin II receptor blocker
c) Angiotensin-converting enzyme inhibitor ✓
d) Acetylcholinesterase inhibitor
e) Alpha-blocker

Answer

Captopril is an angiotensin-converting enzyme (ACE) inhibitor, which inhibits the conversion of angiotensin I to angiotensin II.

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 52 of 121

Which of the following is a common side effect of nifedipine:

a Ankle oedema

b Bradycardia

c AV conduction block

d Precipitation of heart failure

e Bronchospasm

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 52 of 121

Which of the following is a common side effect of nifedipine:

a) Ankle oedema ✔
b) **Bradycardia** ✖
c) AV conduction block
d) Precipitation of heart failure
e) Bronchospasm

Answer

Nifedipine relaxes vascular smooth muscle and dilates coronary and peripheral arteries. Nifedipine has less myocardial effects than verapamil and has no antiarrhythmic properties but has more influence on the vessels. Unlike verapamil it rarely precipitates heart failure because any negative inotropic effect is offset by a reduction in left ventricular work. Nifedipine commonly causes vasodilatory adverse effects – flushing, dizziness, headache, postural hypotension, ankle swelling, which often improve with continued use, although ankle swelling often persists.

Notes

Calcium channel blockers are widely used in the treatment of angina (second line to beta-blockers) and also for hypertension, heart failure and arrhythmias.

Calcium channel blockers vary widely in their predilection for the various possible sites of action and in their therapeutic effects and may be divided into the dihydropyridine type (e.g. amlodipine, nifedipine and nimodipine) and the rate-limiting non-dihydropyridine type (e.g. verapamil, diltiazem).

Mechanism of action

Calcium channel blockers inhibit L-type voltage-sensitive calcium channels in arterial smooth muscle, causing relaxation and vasodilation. They also block calcium channels within the myocardium and conducting tissues of the heart which produces a negative inotropic effect by reducing calcium influx during the plateau phase of the action potential.

The dihydropyridines have relatively little effect on the heart because they have a much higher affinity for inactivated channels found more frequently in vascular muscle. Furthermore, at clinical doses, vasodilation results in a reflex increase in sympathetic tone that counteracts the mild negative inotropic effect. The non-dihydropyridines are rate-limiting calcium-channel blockers that depress the sinus node and slow conduction in the atrioventricular node, causing a mild resting bradycardia.

Contraindications

Non-dihydropyridine CCBs:

- Atrial flutter or fibrillation
- Heart failure or history of heart failure (may precipitate or aggravate symptoms)
- Cardiac outflow obstruction e.g. significant aortic stenosis or obstructive hypertrophic cardiomyopathy (vasodilation may result in reduced cardiac output)
- Second or third degree AV block (may induce complete AV block)
- Severe bradycardia
- Sick sinus syndrome

Dihydropyridine CCBs:

- Uncontrolled heart failure
- Severe hypotension
- Cardiac outflow obstruction

Adverse effects

- Gastrointestinal adverse effects – constipation, nausea, dyspepsia
- Bradycardia, AV block, reflex tachycardia, palpitations
- Vasodilatory adverse effects – flushing, dizziness, headache, postural hypotension, ankle swelling (more common with dihydropyridine calcium-channel blockers and often improve with continued use, although ankle swelling often persists)
- Gingival hyperplasia
- Malaise and fatigue
- Myalgia and arthralgia

Verapamil

Verapamil is used for the treatment of angina, hypertension, and arrhythmias. Verapamil is highly negatively inotropic and reduces cardiac output, slows the heart rate and may impair atrioventricular conduction. It may precipitate heart failure, exacerbate conduction disorders, and cause hypotension at high doses and should not be used with beta-blockers. Constipation is the most common side effect.

Nifedipine

Nifedipine relaxes vascular smooth muscle and dilates coronary and peripheral arteries. Nifedipine has less myocardial effects than verapamil and has no antiarrhythmic properties but has more influence on the vessels. Unlike verapamil it rarely precipitates heart failure because any negative inotropic effect is offset by a reduction in left ventricular work.

Nimodipine

Nimodipine is related to nifedipine but the smooth muscle relaxant effects preferentially act on cerebral arteries. It is used solely for the prevention and treatment of vascular spasm following aneurysmal subarachnoid haemorrhage.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 53 of 121

Which of the following drugs is used first line for a bradyarrhythmia with adverse features:

a Adrenaline

b Amiodarone

c Adenosine

d Atropine

e Dopamine

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 53 of 121

Which of the following drugs is used first line for a bradyarrhythmia with adverse features:

a) Adrenaline
b) Amiodarone
c) Adenosine
d) **Atropine** ✔
e) Dopamine

Answer

If there are adverse features or a risk of asystole, atropine 500 mcg IV bolus should be given. If there is an unsatisfactory response, this can be repeated every 3 – 5 mins up to a maximum dose of 3 mg. Atropine should be used cautiously in the presence of acute myocardial ischaemia or myocardial infarction as the resulting increase in heart rate may worsen ischaemia or increase the size of the infarct.

Notes

The approach to the management of bradyarrhythmias should follow the Resuscitation Council guidelines.

If there are no adverse features (shock, syncope, myocardial ischaemia or heart failure) and no risk of asystole (recent asystole, Mobitz II AV block, complete heart block with broad QRS, ventricular pause > 3 seconds), immediate treatment can be delayed and the patient assessed to try and identify the cause of the bradycardia.

If there are adverse features or a risk of asystole, atropine 500 mcg IV bolus should be given. If there is an unsatisfactory response, this can be repeated every 3 – 5 mins up to a maximum dose of 3 mg. Atropine should be used cautiously in the presence of acute myocardial ischaemia or myocardial infarction as the resulting increase in heart rate may worsen ischaemia or increase the size of the infarct.

Other interim measures may include other drugs such as isoprenaline or adrenaline (or alternately aminophylline, dopamine, glucagon (if beta-blocker or calcium channel blocker overdose) or glycopyrrolate). For a patient with bradycardia and adverse features, if there is no response to atropine, or if atropine is contraindicated, transcutaneous pacing should be initiated immediately. In the presence of life-threatening, extreme bradycardia, percussion pacing should be used as an interim measure until transcutaneous pacing is achieved.

Expert help should be sought and ultimately transvenous pacing arranged.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 54 of 121

In adult advanced life support, which of the following best describes the correct administration of adrenaline for a shockable rhythm:

a Give 1 mg of adrenaline as soon as intravenous access is achieved and every 3 – 5 minutes thereafter

b Give 0.5 mg of adrenaline as soon as intravenous access is achieved and every 3 – 5 minutes thereafter

c Give 1 mg of adrenaline after the third shock and every 3 – 5 minutes thereafter

d Give 0.5 mg of adrenaline after the third shock and every 3 – 5 minutes thereafter

e Give 0.5 mg of adrenaline after the first shock and every 3 – 5 minutes thereafter

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 54 of 121

In adult advanced life support, which of the following best describes the correct administration of adrenaline for a shockable rhythm:

a) Give 1 mg of adrenaline as soon as intravenous access is achieved and every 3 – 5 minutes thereafter

b) Give 0.5 mg of adrenaline as soon as intravenous access is achieved and every 3 – 5 minutes thereafter

c) **Give 1 mg of adrenaline after the third shock and every 3 – 5 minutes thereafter** ✔

d) Give 0.5 mg of adrenaline after the third shock and every 3 – 5 minutes thereafter

e) Give 0.5 mg of adrenaline after the first shock and every 3 – 5 minutes thereafter

Answer

IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter.

Notes

Basic life support

- For chest compressions in adult basic life support the heel of one hand should be placed over the middle of the lower half of the patient's sternum with the other hand on top.
- The sternum should be depressed to a depth of 5 – 6 cm.
- Chest compressions should be performed at a rate of 100 – 120 per minute.
- Thirty compressions should be given before two breaths and that ratio continued (30:2).
- The person giving CPR should be changed every 2 minutes if possible to avoid exhaustion and poor quality chest compressions.
- Interruptions should be minimised (pauses should be < 5 seconds).

Advanced life support

- In adult advanced life support, basic life support should continue whilst the defibrillator pads are attached and the airway managed.
- The pads should be positioned one to the right of the upper sternum below the clavicle and the other in the left midaxillary line in the 5th intercostal space.
- Chest compressions should be paused briefly (< 5 secs) to assess the rhythm and then continued as the defibrillator charges if a shockable rhythm is identified or continued for a further two whole minutes if a non-shockable rhythm is identified.
- When delivering a shock, everybody should be clear of the patient (and any GTN patches and oxygen sources removed).
- Once the shock has been delivered, compressions should resume immediately and continue for a further two minutes before checking the rhythm again or feeling for a pulse.

Shockable rhythm (ventricular fibrillation or pulseless ventricular tachycardia)

- IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter.
- IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Non-shockable rhythm (asystole or pulseless electrical activity)

- IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 55 of 121

In adult advanced life support, what is the correct dose of adrenaline for cardiac arrest:

a 0.5 mg IV adrenaline

b 100 mcg IV adrenaline

c 0.5 mL of 1:1000 solution of IV adrenaline

d 10 mL of 1:10000 solution of IV adrenaline

e 1 mL of 1:10000 solution of IV adrenaline

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 55 of 121

In adult advanced life support, what is the correct dose of adrenaline for cardiac arrest:

a) 0.5 mg IV adrenaline
b) 100 mcg IV adrenaline
c) 0.5 mL of 1:1000 solution of IV adrenaline
d) 10 mL of 1:10000 solution of IV adrenaline ✔
e) **1 mL of 1:10000 solution of IV adrenaline** ✖

Answer

For a shockable rhythm, IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter. For a non-shockable rhythm IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

Notes

Basic life support

- For chest compressions in adult basic life support the heel of one hand should be placed over the middle of the lower half of the patient's sternum with the other hand on top.
- The sternum should be depressed to a depth of 5 – 6 cm.
- Chest compressions should be performed at a rate of 100 – 120 per minute.
- Thirty compressions should be given before two breaths and that ratio continued (30:2).
- The person giving CPR should be changed every 2 minutes if possible to avoid exhaustion and poor quality chest compressions.
- Interruptions should be minimised (pauses should be < 5 seconds).

Advanced life support

- In adult advanced life support, basic life support should continue whilst the defibrillator pads are attached and the airway managed.
- The pads should be positioned one to the right of the upper sternum below the clavicle and the other in the left midaxillary line in the 5th intercostal space.
- Chest compressions should be paused briefly (< 5 secs) to assess the rhythm and then continued as the defibrillator charges if a shockable rhythm is identified or continued for a further two whole minutes if a non-shockable rhythm is identified.
- When delivering a shock, everybody should be clear of the patient (and any GTN patches and oxygen sources removed).
- Once the shock has been delivered, compressions should resume immediately and continue for a further two minutes before checking the rhythm again or feeling for a pulse.

Shockable rhythm (ventricular fibrillation or pulseless ventricular tachycardia)

- IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter.
- IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Non-shockable rhythm (asystole or pulseless electrical activity)

- IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 56 of 121

Which of the following is NOT a typical side effect of captopril:

a Persistent dry cough

b Hypokalaemia

c Angioedema

d Worsening of renal function

e Headache

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 56 of 121

Which of the following is NOT a typical side effect of captopril:

a) Persistent dry cough
b) Hypokalaemia ✔
c) Angioedema
d) **Worsening of renal function** ✖
e) Headache

Answer

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia (risk increased by concomitant use of potassium-sparing diuretic)
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 57 of 121

What is the initial dose of adenosine recommended for management of a regular narrow-complex tachycardia:

a 400 microgram

b 0.5 mg

c 1 mg

d 2 mg

e 6 mg

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 57 of 121

What is the initial dose of adenosine recommended for management of a regular narrow-complex tachycardia:

a) 400 microgram
b) 0.5 mg
c) 1 mg
d) 2 mg
e) **6 mg** ✔

Answer

The first step in treatment of regular narrow-complex tachycardias is to attempt vagal manoeuvres (carotid sinus massage or Valsalva manoeuvre). If the tachyarrhythmia persists, adenosine 6 mg IV should be given as a rapid bolus using a large cannula and a large vein. If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg).

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 58 of 121

Adenosine is contraindicated in which of the following conditions:

a Diabetes mellitus

b Hypertension

c Peripheral vascular disease

d Asthma

e Myasthenia gravis

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 58 of 121

Adenosine is contraindicated in which of the following conditions:

a) Diabetes mellitus
b) Hypertension
c) Peripheral vascular disease
d) **Asthma** ✔
e) Myasthenia gravis

Answer

Adenosine is contraindicated in:

- Asthma and COPD (can cause bronchospasm)
- Decompensated heart failure
- Long QT syndrome
- Second- or third-degree AV block and sick sinus syndrome (unless pacemaker fitted)
- Severe hypotension

Notes

Adenosine is usually the treatment of choice for terminating paroxysmal supraventricular tachycardia including those associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome.

Mechanism of action

Adenosine stimulates A1-adenosine receptors and opens acetylcholine sensitive K+ channels, increasing K+ efflux. This hyperpolarises the cell membrane in the atrioventricular node and, by inhibiting the calcium channels, slows conduction in the AVN. As it has a very short duration of action (half-life only about 8 – 10 seconds), most side effects are short lived.

Administration

For a regular narrow-complex tachycardia the first step is to attempt vagal manoeuvres. If this is unsuccessful and the tachyarrhythmia persists, 6 mg intravenous adenosine should be administered into a central/large vein over 2 seconds, followed by 12 mg after 1 – 2 minutes if required, then a further 12 mg after 1 – 2 minutes if required (max 30 mg).

The effects of adenosine are potentiated by dipyridamole, therefore if it is essential to give adenosine in a patient taking dipyridamole the dose should be quartered.

The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection. If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.

Contraindications

Adenosine is contraindicated in:

- Asthma and COPD (can cause bronchospasm)
- Decompensated heart failure
- Long QT syndrome
- Second- or third-degree AV block and sick sinus syndrome (unless pacemaker fitted)
- Severe hypotension

Adverse effects

Common side effects of adenosine include:

- Apprehension
- Dizziness, flushing, headache, nausea, dyspnoea
- Angina (discontinue)
- AV block, sinus pause and arrhythmia (discontinue if asystole or severe bradycardia occur)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 59 of 121

Bendoflumethiazide may cause all of the following electrolyte imbalances EXCEPT for:

a Hypomagnesaemia

b Hypocalcaemia

c Hypokalaemia

d Hypochloraemic alkalosis

e Hyponatraemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 59 of 121

Bendoflumethiazide may cause all of the following electrolyte imbalances EXCEPT for:

a) Hypomagnesaemia
b) Hypocalcaemia ✔
c) **Hypokalaemia** ✖
d) Hypochloraemic alkalosis
e) Hyponatraemia

Answer

Common side effects of thiazide diuretics include:

- Excessive diuresis
  - Postural hypotension, dehydration, renal impairment
- Acid-base and electrolyte imbalance
  - Hypokalaemia, hyponatraemia, hypomagnesaemia, hypercalcaemia, hypochloraemic alkalosis
- Metabolic imbalance
  - Hyperuricaemia and gout
  - Impaired glucose tolerance and hyperglycaemia
  - Altered plasma-lipid concentrations
- Mild gastrointestinal disturbances

Notes

Thiazide diuretics are moderately potent diuretics, and are used to relieve oedema in chronic heart failure, and in the management of hypertension. They act within 1 to 2 hours of oral administration and most have a duration of action of 12 to 24 hours.

Mechanism of action

Thiazides act mainly on the early segments of distal tubule where they inhibit NaCl reabsorption by binding to the the Na+/Cl- cotransporter. Excretion of Cl-, Na+ and accompanying water is increased. The increased Na+ load in the distal tubule stimulates Na+ exchange with K+ and H+, increasing their excretion and causing hypokalaemia and a metabolic alkalosis. Excretion of Ca2+ is reduced.

Indications

Bendroflumethiazide is used for oedema in mild or moderate heart failure. Combination diuretic therapy (with loop and thiazide diuretics) may be effective in patients with oedema resistant to treatment with one diuretic.

Thiazide diuretics are licensed for the treatment of hypertension but are no longer considered the first line diuretic for this indication. In the management of hypertension a low dose of a thiazide produces a maximal or near-maximal blood pressure lowering effect, with very little biochemical disturbance. Higher doses cause more marked changes in plasma potassium, sodium, uric acid, glucose, and lipids, with little advantage in blood pressure control.

Contraindications

Thiazide diuretics are contraindicated in:

- Addison's disease
- Hypercalcaemia
- Hyponatraemia
- Refractory hypokalaemia
- Symptomatic hyperuricaemia
- Severe hepatic impairment (may precipitate encephalopathy)

Cautions

Thiazide diuretics should be used with caution in:

- Diabetes mellitus (may exacerbate)
- Gout (may exacerbate)
- Systemic lupus erythematosus (may exacerbate)
- Hyperaldosteronism
- Malnourishment
- Nephrotic syndrome

Adverse effects

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects. The dose should then be adjusted according to renal function.

Common side effects of thiazide diuretics include:

- Excessive diuresis
  - Postural hypotension, dehydration, renal impairment
- Acid-base and electrolyte imbalance
  - Hypokalaemia, hyponatraemia, hypomagnesaemia, hypercalcaemia, hypochloraemic alkalosis
- Metabolic imbalance
  - Hyperuricaemia and gout
  - Impaired glucose tolerance and hyperglycaemia
  - Altered plasma-lipid concentrations
- Mild gastrointestinal disturbances

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic. Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 60 of 121

Which of the following is the first line treatment for a stable regular narrow-complex tachycardia:

a Adenosine

b Synchronised DC cardioversion

c Vagal manoeuvres

d Amiodarone

e Beta-blocker

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 60 of 121

Which of the following is the first line treatment for a stable regular narrow-complex tachycardia:

a) Adenosine ✗
b) Synchronised DC cardioversion
c) Vagal manoeuvres ✓
d) Amiodarone
e) Beta-blocker

Answer

The first step in treatment of regular narrow-complex tachycardias is to attempt vagal manoeuvres (carotid sinus massage or Valsalva manoeuvre). If the tachyarrhythmia persists, adenosine 6 mg IV should be given as a rapid bolus using a large cannula and a large vein. If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg).

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 61 of 121

A 70 year old man is brought to ED by ambulance with sudden onset chest pain, palpitations and shortness of breath. His HR is 160 bpm and BP 90/65. ECG demonstrates new-onset fast atrial fibrillation. Which of the following is the first-line treatment option in this case:

a Beta-blocker

b Diltiazem

c Digoxin

d Amiodarone

e Synchronised DC cardioversion

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 61 of 121

A 70 year old man is brought to ED by ambulance with sudden onset chest pain, palpitations and shortness of breath. His HR is 160 bpm and BP 90/65. ECG demonstrates new-onset fast atrial fibrillation. Which of the following is the first-line treatment option in this case:

a) Beta-blocker
b) Diltiazem
c) Digoxin
d) Amiodarone
e) **Synchronised DC cardioversion** ✔

Answer

All patients with adverse features suggesting life-threatening haemodynamic instability (shock, syncope, heart failure, myocardial ischaemia) caused by new onset atrial fibrillation should undergo emergency electrical cardioversion with synchronised DC shock without delaying to achieve anticoagulation.

Notes

Treatment of patients with atrial fibrillation aims to reduce symptoms and prevent complications, especially stroke. Atrial fibrillation may be managed by either controlling the ventricular rate (rate control) or by attempting to restore and maintain sinus rhythm (rhythm control).

New-onset atrial fibrillation

All patients with adverse features suggesting life-threatening haemodynamic instability (shock, syncope, heart failure, myocardial ischaemia) caused by new onset atrial fibrillation should undergo emergency electrical cardioversion with synchronised DC shock without delaying to achieve anticoagulation.

In patients presenting acutely (< 48 hrs) with new onset AF but without adverse features, immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation).

- For rate-control, the usual drug of choice is a beta-blocker. Diltiazem may be used in patients in whom beta-blockade is contraindicated or not tolerated. Digoxin may be used in patients with heart failure. Amiodarone may be used to assist with rate control but is most useful in maintaining rhythm control.
- For rhythm-control, chemical cardioversion may be appropriate. Class 1c antiarrhythmic drugs such as flecainide or propafenone may be used but are contraindicated in the presence of heart failure, left ventricular impairment, ischaemic heart disease or prolonged QT-interval. Amiodarone (300 mg intravenously over 20 – 60 mins followed by 900 mg over 24 h) may be used to attempt chemical cardioversion but is less often effective and takes longer to act.
- Electrical cardioversion remains an option in this setting and will restore sinus rhythm in more patients than chemical cardioversion.

The longer a person remains in AF, the greater is the likelihood of atrial thrombus developing. In general, people who have been in AF for > 48 h should not be treated by cardioversion (electrical or chemical) until they have been fully anticoagulated for at least 3 weeks, or unless transoesophageal echocardiography has detected no evidence of atrial thrombus.

Long-term management

In general, rate control is the preferred first line drug treatment strategy for atrial fibrillation in most patients except in patients with:

- new onset atrial fibrillation
- heart failure secondary to atrial fibrillation
- atrial flutter suitable for an ablation strategy
- atrial fibrillation with a reversible cause
- or if rhythm control is more suitable based on clinical judgement.

Rate control may be achieved with a beta-blocker or a rate limiting non-dihydropyridine calcium channel blocker e.g. verapamil or diltiazem.

Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation or in combination therapy in resistant cases. Digoxin is also used when atrial fibrillation is accompanied by congestive heart failure.

If symptoms are not controlled with a combination of two drugs, a rhythm-control strategy should be considered.

All patients with AF should be assessed and managed for risk of stroke and thromboembolism, and risk of bleeding if anticoagulation is being considered.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 62 of 121

What is the main mechanism of action of unfractionated heparin:

a Inhibits vitamin K dependent clotting factors

b Inhibits factor Xa

c Potentiate effects of antithrombin

d Directly inhibits thrombin

e Blocks GPIIb/IIIa receptor sites

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 62 of 121

What is the main mechanism of action of unfractionated heparin:

a) Inhibits vitamin K dependent clotting factors
b) **Inhibits factor Xa** ✖
c) Potentiate effects of antithrombin ✔
d) Directly inhibits thrombin
e) Blocks GPIIb/IIIa receptor sites

Answer

Heparin potentiates the activity of antithrombin III, causing inactivation of thrombin. The heparin-antithrombin III complex also inhibits factor Xa and some other factors. Low molecular weight heparin (LMWH) preparations inhibit only factor Xa.

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Heparin potentiates the activity of antithrombin III, causing inactivation of thrombin. The heparin-antithrombin III complex also inhibits factor Xa and some other factors. Low molecular weight heparin (LMWH) preparations inhibit only factor Xa. PT and APTT may both be prolonged but the PT less so.

Contraindications

Heparins are contraindicated:

- In people with current (or history of) heparin-induced thrombocytopenia
- In people with acute bacterial endocarditis
- In people with active major bleeding, and conditions with a high risk of uncontrolled bleeding, including recent haemorrhagic stroke, major trauma, recent brain, spinal cord or eye surgery, haemophilia and thrombocytopenia
- In people with active gastric or duodenal ulceration

Adverse effects

- Bleeding
- Heparin-induced thrombocytopenia (immune-mediated effect that usually develops after 5 – 10 days, signs may include a 30% reduction of platelet count, thrombosis, or skin allergy; if HIT is suspected or confirmed, heparin should be discontinued and an alternative anticoagulant given)
- Hyperkalaemia (due to inhibition of aldosterone secretion; patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium or those taking potassium-sparing drugs seem to be more susceptible)
- Osteoporosis (risk lower with LMWH)
- Alopecia
- Hypersensitivity reactions
- Injection site reactions

Low molecular weight heparin vs unfractionated heparin

Unfractionated heparin is usually given by continuous intravenous infusion for the smoothest control and is the treatment of choice where rapid reversal of anticoagulation may be required (e.g. in surgical patients or late pregnancy). Therapy is monitored by maintaining the APTT at 1.5 – 2.5 times the upper limit of normal.

Low molecular weight heparin (LMWH) preparations have largely replaced unfractionated heparin.

Advantages of LMWH
Greater ability to inhibit factor Xa directly, interacting less with platelets and so may have a lesser tendency to cause bleeding
Greater bioavailability and longer half-life in plasma making once daily subcutaneous administration possible
More predictable dose response avoiding the need for routine anticoagulant monitoring
Lower associated risk of heparin-induced thrombocytopenia or of osteoporosis

Haemorrhage

Because it has a short duration of action, if haemorrhage occurs it is usually sufficient to withdraw unfractionated or low molecular weight heparin, but if rapid reversal of the effects of the heparin is required, protamine sulfate is a specific antidote (but only partially reverses the effects of low molecular weight heparins).

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 63 of 121

Which of the following does NOT predispose to digoxin toxicity in a patient taking digoxin:

a Hypoxia

b Hypercalcaemia

c Hypokalaemia

d Hypomagnesaemia

e Hyponatraemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 63 of 121

Which of the following does NOT predispose to digoxin toxicity in a patient taking digoxin:

a) Hypoxia
b) Hypercalcaemia
c) Hypokalaemia
d) **Hypomagnesaemia** ✖
e) Hyponatraemia ✔

Answer

Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Although hyponatremia can result in the development of other pathological disturbances, it does not potentiate digoxin toxicity.

Notes

Digoxin is a cardiac glycoside that increases the force of myocardial contraction (positive inotrope), and slows the heart rate (negative chronotrope). Digoxin has a narrow therapeutic index; digoxin toxicity can occur even when the serum digoxin concentration is within the therapeutic range (between 0.7 – 2.0 mcg/L).

Mechanism of action

Inotropic effect:

Digoxin inhibits membrane Na+/K+ ATPase, which is responsible for Na+/K+ exchange across the myocyte cell membrane. This increases intracellular Na+ and produces a secondary increase in intracellular Ca2+ that increases the force of myocardial contraction. The increase in intracellular Ca2+ occurs because the decreased Na+ gradient across the membrane reduces the extrusion of Ca2+ by the Na+/Ca2+ exchanger that normally occurs during diastole. Digoxin and K+ ions compete for the receptor on the outside of the muscle cell membrane, and so the effects of digoxin may be dangerously increased in hypokalaemia.

Chronotropic effect:

Digoxin stimulates vagal activity , causing the release of ACh, which slows the heart rate, slows atrioventricular conduction and prolongs the refractory period in the AVN and bundle of His. By delaying AV conduction, digoxin increases the degree of block, and slows and strengthens the ventricular beat.

Indications

Digoxin is most useful for controlling the ventricular response in persistent and permanent atrial fibrillation and atrial flutter. Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation. It is now rarely used for rapid control of heart rate, as even with intravenous administration, response may take many hours.

Digoxin also has a role in the management of heart failure; digoxin improves symptoms of heart failure and exercise tolerance and reduces hospitalisation due to acute exacerbations but it does not reduce mortality. Digoxin is reserved for patients with worsening or severe heart failure due to left ventricular systolic dysfunction refractory to combination therapy with first-line agents.

Contraindications

Digoxin is contraindicated in:

- Supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome
- Ventricular tachycardia or fibrillation
- Heart conduction problems e.g. second degree or intermittent complete heart block
- Hypertrophic cardiomyopathy (unless concomitant atrial fibrillation and heart failure but should be used with caution)

Cautions

Digoxin should be used with caution in:

- Hypercalcaemia (risk of digitalis toxicity)
- Hypokalaemia (risk of digitalis toxicity; diuretics may predispose to hypokalaemia)
- Hypomagnesaemia (risk of digitalis toxicity)
- Hypoxia (risk of digitalis toxicity)
- Recent myocardial infarction
- Severe respiratory disease
- Sick sinus syndrome
- Thyroid disease
- Constrictive pericarditis
- Renal impairment (reduce dose and monitor plasma-digoxin concentration; toxicity increased by electrolyte disturbances)
- Elderly people (reduce dose)
- Concomitant drug therapy with drugs which may increase plasma concentration of digoxin e.g. amiodarone, antimicrobials, calcium-channel blockers, spironolactone

Adverse effects

The adverse effects of digoxin are frequently due to its narrow therapeutic window and include:

- Cardiac adverse effects
  - Sinoatrial and atrioventricular block
  - Premature ventricular contractions
  - PR prolongation and ST-segment depression
- Nausea, vomiting and diarrhoea
- Blurred or yellow vision
- CNS effects
  - weakness, dizziness, confusion, apathy, malaise, headache, depression, psychosis
- Thrombocytopenia and agranulocytosis (rare)
- Gynaecomastia in men in prolonged administration

Digoxin toxicity

Unwanted effects of digoxin depend on both the plasma concentration of digoxin (increasing risk of toxicity through the range 1.5 – 3 mcg/L) and on the sensitivity of the conducting system or of the myocardium, which is often increased in heart disease. Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Care should also be taken in the elderly who are particularly susceptible to digoxin toxicity.

If toxicity occurs, digoxin should be withdrawn. Digoxin-specific antibody fragments are indicated for the treatment of known or strongly suspected life-threatening digoxin toxicity associated with ventricular arrhythmias or bradyarrhythmias unresponsive to atropine sulfate and when measures beyond the withdrawal of digoxin and correction of any electrolyte abnormalities are considered necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 64 of 121

Which of the following drugs can be used as reversal agent for warfarin:

a Protamine sulfate

b Hydroxocobalamin

c Phytomenadione

d Idarucizumab

e Abciximab

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 64 of 121

Which of the following drugs can be used as reversal agent for warfarin:

a) Protamine sulfate
b) Hydroxocobalamin
c) **Phytomenadione** ✔
d) Idarucizumab
e) Abciximab

Answer

Warfarin may need to be omitted for a couple of doses if the INR rises above the target range or even reversed if the INR is > 8.0 or there are signs of bleeding. Phytomenadione (vitamin K) can be given as a specific antidote to warfarin or in cases of major bleeding, dried prothrombin complex (factors II, VII, IX, and X); if dried prothrombin complex is unavailable, fresh frozen plasma can be given but is less effective.

Scenario	Management
INR 5.0 – 8.0, no bleeding	Withhold 1 – 2 doses of warfarin and reduce subsequent maintenance dose
INR 5.0 – 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, restart warfarin when INR < 5.0
INR > 8.0, no bleeding	Stop warfarin, give phytomenadione orally, restart warfarin when INR < 5.0
INR > 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, repeat dose if INR still too high after 24 h, restart warfarin when INR < 5.0
Major bleeding	Stop warfarin, give phytomenadione intravenously, give dried prothrombin complex

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Warfarin is a vitamin K antagonist and will reduce the activity of vitamin-K dependent clotting factors (factors VII, IX, X and II) and of protein C and S.

Both the PT and APTT are usually prolonged but the PT is grossly prolonged and the APTT only mildly.

Indications

Warfarin is licensed for:

- Prophylaxis of systemic embolism in people with rheumatic heart disease and atrial fibrillation
- Prophylaxis after insertion of prosthetic heart valves
- Prophylaxis and treatment of venous thrombosis and pulmonary embolism
- Transient attacks of cerebral ischaemia

Warfarin takes at least 48 to 72 hours for the anticoagulant effect to develop and if an immediate effect is required, heparin must be given concomitantly and continued for at least 5 days and until the INR is greater or equal to 2.0 for more than 24 hours. The duration of treatment is dependent on the indication.

Contraindications

- Haemorrhagic stroke
- Clinically significant bleeding
- Within 72 hours of major surgery with risk of severe bleeding
- Within 48 hours postpartum
- Pregnancy
- Untreated bleeding disorders for example, thrombocytopenia, haemophilia, liver failure and renal failure
- Potential bleeding lesions for example; active peptic ulcer; oesophageal varices; aneurysm; proliferative retinopathy; recent organ biopsy; recent trauma or surgery to head, orbit, or spine; recent stroke; confirmed intracranial or intraspinal bleed

Cautions

Warfarin should be used with caution in any patient at increased risk of haemorrhage with risk factors including:

- People aged over 65 years
- Previous bleeding episode, history of gastrointestinal bleeding or anaemia
- Recent ischaemic stroke, hypertension, heart disease, cerebrovascular disease, renal disease, liver disease, active peptic ulcer
- Recent or imminent surgery or trauma
- Excessive alcohol intake, frequent or significant falls
- Regular use of NSAIDs or other drugs that increase risk of bleeding

Adverse effects

- The most common adverse effect of warfarin is bleeding
- Other common adverse effects of warfarin include nausea, vomiting, diarrhoea, jaundice, hepatic dysfunction, pancreatitis, pyrexia, alopecia, purpura, and rash
- Skin necrosis is a rare but serious adverse effect of warfarin; treatment with warfarin should be stopped if warfarin related skin necrosis is suspected
- Calciphylaxis is a rare, but a very serious condition that causes vascular calcification and cutaneous necrosis

Monitoring

The prothrombin time, reported as the INR is used to monitor warfarin therapy; the target INR is dependent on the indication.

Warfarin may need to be omitted for a couple of doses if the INR rises above the target range or even reversed if the INR is > 8.0 or there are signs of bleeding. Phytomenadione (vitamin K) can be given as a specific antidote to warfarin or in cases of major bleeding, dried prothrombin complex (factors II, VII, IX, and X); if dried prothrombin complex is unavailable, fresh frozen plasma can be given but is less effective.

Scenario	Management
INR 5.0 – 8.0, no bleeding	Withhold 1 – 2 doses of warfarin and reduce subsequent maintenance dose
INR 5.0 – 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, restart warfarin when INR < 5.0
INR > 8.0, no bleeding	Stop warfarin, give phytomenadione orally, restart warfarin when INR < 5.0
INR > 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, repeat dose if INR still too high after 24 h, restart warfarin when INR < 5.0
Major bleeding	Stop warfarin, give phytomenadione intravenously, give dried prothrombin complex

Drug interactions

Increased anticoagulant effect	Decreased anticoagulant effect
Alcohol	Tricyclic antidepressants
Amiodarone	St John's wort
Antibiotics(co-trimoxazole, metronidazole, quinolones, macrolides)	Vitamin K-containing vitamin complexes, some enteral feeds, mineral supplements, and green vegetables
Antidepressants (SSRIs, SNRIs, TCAs)	Rifampicin
Azoles	Carbamazepine
Cranberry juice	Phenobarbital
Corticosteroids	Primidone
Fibrates	Azathioprine
NSAIDs	Phenytoin
Thyroxine	Griseofulvin

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 65 of 121

Nitrates are most commonly used in the management of:

a Aortic stenosis

b Angina

c Raised intracranial pressure

d Renovascular disease

e Arrhythmias

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 65 of 121

Nitrates are most commonly used in the management of:

a) Aortic stenosis
b) **Angina** ✔
c) Raised intracranial pressure
d) Renovascular disease
e) Arrhythmias

Answer

Nitrates are useful in the management of angina. Although they are potent coronary vasodilators, the main benefit derives from a reduction in venous return which in turn reduces left ventricular effort, decreasing oxygen demands and relieving anginal pain. Vasodilators can also act in heart failure by arteriolar dilatation which reduces both peripheral vascular resistance and left ventricular pressure during systole resulting in improved cardiac output. They can also cause venous dilatation which results in dilatation of capacitance vessels, increase of venous pooling, and diminution of venous return to the heart (decreasing left ventricular end-diastolic pressure).

Notes

Nitrates are useful in the management of angina. Although they are potent coronary vasodilators, the main benefit derives from a reduction in venous return which in turn reduces left ventricular effort, decreasing oxygen demands and relieving anginal pain.

Vasodilators can also act in heart failure by arteriolar dilatation which reduces both peripheral vascular resistance and left ventricular pressure during systole resulting in improved cardiac output. They can also cause venous dilatation which results in dilatation of capacitance vessels, increase of venous pooling, and diminution of venous return to the heart (decreasing left ventricular end-diastolic pressure).

Mechanism of action

Initial metabolism of these drugs releases nitrite ions, which undergoes intracellular conversion to nitric oxide (NO). Nitric oxide then activates guanylyl cyclase, causing an increase in the intracellular concentration of cGMP in the vascular smooth muscle cells. cGMP activates protein kinase G, an enzyme that ultimately causes vascular smooth muscle relaxation.

Type examples

Sublingual glyceryl trinitrate (GTN) is one of the most effective drugs for providing rapid relief of angina, although its effects only last for 20 – 30 minutes. It may be administered as sublingual tablets or by sublingual administration using aerosol spray.

If sublingual glyceryl trinitrate is required more than twice a week, then combined therapy is required, where beta-blockers or calcium-channel blockers are taken in addition to nitrates which are reserved for acute attacks. If necessary, a long-acting nitrate is added.

Long-acting nitrates are more stable and may be effective for several hours, depending on the drug and the preparation (sublingual, oral, modified release). Isosorbide dinitrate is widely used; duration of action of up to 12 hours is claimed for modified-release preparations. The use of isosorbide mononitrate, which is the main active metabolite of the dinitrate, avoids the variable absorption and unpredictable first-pass metabolism of the dinitrate.

Glyceryl trinitrate or isosorbide dinitrate may be tried by intravenous injection when the sublingual form is ineffective in patients with chest pain due to myocardial infarction or severe ischaemia. Intravenous injections are also useful in the treatment of congestive heart failure.

Adverse effects

Side effects such as dizziness, flushing, tachycardia, throbbing headache and postural hypotension may limit therapy, especially when angina is severe or when patients are unusually sensitive to the effects of nitrates. Prolonged high dosage may cause methaemoglobinaemia as a result of oxidation of haemoglobin.

Contraindications

Nitrates should not be used in people with:

- Acute myocardial infarction (MI) with low filling pressure, acute circulatory failure, (shock, vascular collapse), or very low blood pressure
- Hypertrophic obstructive cardiomyopathy (HOCM), constrictive pericarditis, cardiac tamponade, low cardiac filling pressures, or aortic/mitral valve stenosis
- Diseases associated with a raised intracranial pressure (for example following a head trauma, including cerebral haemorrhage)
- Severe anaemia
- Closed angle glaucoma
- Severe hypotension, or hypovolaemia

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 66 of 121

What is the main mechanism of action of flecainide:

a Blocks Ca2+ channels

b Opens Na+ channels

c Blocks Na+ channels

d Opens K+ channels

e Closes K+ channels

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 66 of 121

What is the main mechanism of action of flecainide:

a) Blocks Ca2+ channels
b) Opens Na+ channels
c) **Blocks Na+ channels** ✔
d) Opens K+ channels
e) Closes K+ channels

Answer

Flecainide inhibits the transmembrane influx of extracellular Na+ ions via fast channels on cardiac tissues resulting in a decrease in rate of depolarisation of the action potential, prolonging the PR and QRS intervals. At high concentrations, it exerts inhibitory effects on slow Ca2+ channels, accompanied by moderate negative inotropic effect.

Notes

Flecainide acetate is an orally active class Ic antiarrhythmic and may be of value for serious symptomatic ventricular arrhythmias. It may also be indicated for junctional re-entry tachycardias and for paroxysmal atrial fibrillation. However, it has a negative inotropic action and can precipitate serious arrhythmias in a small minority of patients (including those with otherwise normal hearts).

Contraindications

Flecainide is contraindicated in:

- Abnormal left ventricular function
- Atrial conduction defects (unless pacing rescue available)
- Bundle branch block (unless pacing rescue available)
- Distal block (unless pacing rescue available)
- Haemodynamically significant valvular heart disease
- Heart failure
- History of myocardial infarction and either asymptomatic ventricular ectopics or asymptomatic non-sustained ventricular tachycardia
- Long-standing atrial fibrillation where conversion to sinus rhythm not attempted
- Second-degree or greater AV block (unless pacing rescue available)
- Sinus node dysfunction (unless pacing rescue available)

Cautions

Flecainide should be used with caution in:

- Atrial fibrillation following heart surgery
- Elderly (accumulation may occur)
- Patients with pacemakers (especially those who may be pacemaker dependent because stimulation threshold may rise appreciably)

Adverse effects

Common side effects of flecainide include:

- Asthenia
- Dizziness
- Dyspnoea
- Fatigue
- Fever
- Oedema
- Pro-arrhythmic effects
- Visual disturbances

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 67 of 121

The risk of renal impairment in a patient on ACE inhibitor therapy is increased by concomitant treatment with which of the following drug classes:

a Beta-blockers

b NSAIDs

c Statins

d Nitrates

e Calcium channel blockers

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 67 of 121

The risk of renal impairment in a patient on ACE inhibitor therapy is increased by concomitant treatment with which of the following drug classes:

a) Beta-blockers
b) **NSAIDs** ✔
c) Statins
d) Nitrates
e) Calcium channel blockers

Answer

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 68 of 121

Thiazide diuretics are contraindicated in which of the following:

a Asthma

b Recent myocardial infarction

c Addison's disease

d Acute intermittent porphyria

e Atrioventricular block

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 68 of 121

Thiazide diuretics are contraindicated in which of the following:

a) Asthma
b) Recent myocardial infarction
c) Addison's disease ✔
d) **Acute intermittent porphyria** ✖
e) Atrioventricular block

Answer

Thiazide diuretics are contraindicated in:

- Addison's disease
- Hypercalcaemia
- Hyponatraemia
- Refractory hypokalaemia
- Symptomatic hyperuricaemia
- Severe hepatic impairment (may precipitate encephalopathy)

Notes

Thiazide diuretics are moderately potent diuretics, and are used to relieve oedema in chronic heart failure, and in the management of hypertension. They act within 1 to 2 hours of oral administration and most have a duration of action of 12 to 24 hours.

Mechanism of action

Thiazides act mainly on the early segments of distal tubule where they inhibit NaCl reabsorption by binding to the the Na+/Cl- cotransporter. Excretion of Cl-, Na+ and accompanying water is increased. The increased Na+ load in the distal tubule stimulates Na+ exchange with K+ and H+, increasing their excretion and causing hypokalaemia and a metabolic alkalosis. Excretion of Ca2+ is reduced.

Indications

Bendroflumethiazide is used for oedema in mild or moderate heart failure. Combination diuretic therapy (with loop and thiazide diuretics) may be effective in patients with oedema resistant to treatment with one diuretic.

Thiazide diuretics are licensed for the treatment of hypertension but are no longer considered the first line diuretic for this indication. In the management of hypertension a low dose of a thiazide produces a maximal or near-maximal blood pressure lowering effect, with very little biochemical disturbance. Higher doses cause more marked changes in plasma potassium, sodium, uric acid, glucose, and lipids, with little advantage in blood pressure control.

Contraindications

Thiazide diuretics are contraindicated in:

- Addison's disease
- Hypercalcaemia
- Hyponatraemia
- Refractory hypokalaemia
- Symptomatic hyperuricaemia
- Severe hepatic impairment (may precipitate encephalopathy)

Cautions

Thiazide diuretics should be used with caution in:

- Diabetes mellitus (may exacerbate)
- Gout (may exacerbate)
- Systemic lupus erythematosus (may exacerbate)
- Hyperaldosteronism
- Malnourishment
- Nephrotic syndrome

Adverse effects

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects. The dose should then be adjusted according to renal function.

Common side effects of thiazide diuretics include:

- Excessive diuresis
  - Postural hypotension, dehydration, renal impairment
- Acid-base and electrolyte imbalance
  - Hypokalaemia, hyponatraemia, hypomagnesaemia, hypercalcaemia, hypochloraemic alkalosis
- Metabolic imbalance
  - Hyperuricaemia and gout
  - Impaired glucose tolerance and hyperglycaemia
  - Altered plasma-lipid concentrations
- Mild gastrointestinal disturbances

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic. Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 69 of 121

Which of the following is first-line treatment for a tachyarrhythmia associated with shock:

a Amiodarone

b Synchronised DC shock

c Lidocaine

d Adenosine

e Intravenous magnesium

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 69 of 121

Which of the following is first-line treatment for a tachyarrhythmia associated with shock:

a) Amiodarone
b) **Synchronised DC shock** ✔
c) Lidocaine
d) Adenosine
e) Intravenous magnesium

Answer

If any adverse features are present, emergency cardioversion with synchronised DC shock is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 70 of 121

Intravenous lidocaine may be indicated for which of the following:

a Refractory asystole in cardiac arrest

b Refractory ventricular fibrillation in cardiac arrest

c Terminating paroxysmal supraventricular tachycardia

d Chemical cardioversion of atrial fibrillation

e Bradyarrhythmias associated with adverse features

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 70 of 121

Intravenous lidocaine may be indicated for which of the following:

a) Refractory asystole in cardiac arrest
b) **Refractory ventricular fibrillation in cardiac arrest** ✔
c) Terminating paroxysmal supraventricular tachycardia
d) Chemical cardioversion of atrial fibrillation
e) Bradyarrhythmias associated with adverse features

Answer

Intravenous lidocaine hydrochloride can be used for the treatment of ventricular tachycardia in haemodynamically stable patients, and ventricular fibrillation and pulseless ventricular tachycardia in cardiac arrest refractory to defibrillation, however it is a second-line choice (behind amiodarone).

Notes

Intravenous lidocaine hydrochloride can be used for the treatment of ventricular tachycardia in haemodynamically stable patients, and ventricular fibrillation and pulseless ventricular tachycardia in cardiac arrest refractory to defibrillation, however it is a second-line choice (behind amiodarone).

Mechanism of action

Lidocaine is a class Ib agent which blocks inactivated voltage-dependent Na+ channels, making it highly selective for damaged tissues. In normal cardiac tissues, lidocaine has little effect because it dissociates rapidly from the Na+ channels which therefore recover during diastole. However, in ischaemic areas, where anoxia causes depolarisation and arrhythmogenic activity, many Na+ channels are inactivated and therefore susceptible to lidocaine.

Contraindications

Intravenous lidocaine is contraindicated in:

- All grades of atrioventricular block
- Severe myocardial depression
- Sinoatrial disorders

Cautions

Intravenous lidocaine should be used with caution in:

- Acute porphyria (consider infusion with glucose for its anti-porphyrinogenic effects)
- Congestive cardiac failure (consider lower dose)
- Post cardiac surgery (consider lower dose)

Adverse effects

Common side effects of intravenous lidocaine include:

- Bradycardia and hypotension (may lead to cardiac arrest)
- Dizziness, drowsiness, paraesthesia, confusion (particularly if injection too rapid)
- Convulsions
- Respiratory depression

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 71 of 121

What is the mechanism of action of digoxin as a positive inotrope:

a Stimulation of Na+/Ca2+ exchanger

b Inhibition of Na+/K+ ATPase pump

c Inhibition of Na+/Ca2+ exchanger

d Beta-adrenoceptor agonist

e Stimulation of Ca2+ ATPase

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 71 of 121

What is the mechanism of action of digoxin as a positive inotrope:

a) Stimulation of Na+/Ca2+ exchanger
b) **Inhibition of Na+/K+ ATPase pump** ✔
c) Inhibition of Na+/Ca2+ exchanger
d) Beta-adrenoceptor agonist
e) Stimulation of Ca2+ ATPase

Answer

Digoxin directly inhibits membrane Na+/K+ ATPase, which is responsible for Na+/K+ exchange across the myocyte cell membrane. This increases intracellular Na+ and produces a secondary increase in intracellular Ca2+ that increases the force of myocardial contraction. The increase in intracellular Ca2+ occurs because the decreased Na+ gradient across the membrane reduces the extrusion of Ca2+ by the Na+/Ca2+ exchanger that normally occurs during diastole. Digoxin and K+ ions compete for the receptor on the outside of the muscle cell membrane, and so the effects of digoxin may be dangerously increased in hypokalaemia.

Notes

Digoxin is a cardiac glycoside that increases the force of myocardial contraction (positive inotrope), and slows the heart rate (negative chronotrope). Digoxin has a narrow therapeutic index; digoxin toxicity can occur even when the serum digoxin concentration is within the therapeutic range (between 0.7 – 2.0 mcg/L).

Mechanism of action

Inotropic effect:

Digoxin directly inhibits membrane Na+/K+ ATPase, which is responsible for Na+/K+ exchange across the myocyte cell membrane. This increases intracellular Na+ and produces a secondary increase in intracellular Ca2+ that increases the force of myocardial contraction. The increase in intracellular Ca2+ occurs because the decreased Na+ gradient across the membrane reduces the extrusion of Ca2+ by the Na+/Ca2+ exchanger that normally occurs during diastole. Digoxin and K+ ions compete for the receptor on the outside of the muscle cell membrane, and so the effects of digoxin may be dangerously increased in hypokalaemia.

Chronotropic effect:

Digoxin stimulates vagal activity , causing the release of ACh, which slows the heart rate, slows atrioventricular conduction and prolongs the refractory period in the AVN and bundle of His. By delaying AV conduction, digoxin increases the degree of block, and slows and strengthens the ventricular beat.

Indications

Digoxin is most useful for controlling the ventricular response in persistent and permanent atrial fibrillation and atrial flutter. Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation. It is now rarely used for rapid control of heart rate, as even with intravenous administration, response may take many hours.

Digoxin also has a role in the management of heart failure; digoxin improves symptoms of heart failure and exercise tolerance and reduces hospitalisation due to acute exacerbations but it does not reduce mortality. Digoxin is reserved for patients with worsening or severe heart failure due to left ventricular systolic dysfunction refractory to combination therapy with first-line agents.

Contraindications

Digoxin is contraindicated in:

- Supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome
- Ventricular tachycardia or fibrillation
- Heart conduction problems e.g. second degree or intermittent complete heart block
- Hypertrophic cardiomyopathy (unless concomitant atrial fibrillation and heart failure but should be used with caution)

Cautions

Digoxin should be used with caution in:

- Hypercalcaemia (risk of digitalis toxicity)
- Hypokalaemia (risk of digitalis toxicity; diuretics may predispose to hypokalaemia)
- Hypomagnesaemia (risk of digitalis toxicity)
- Hypoxia (risk of digitalis toxicity)
- Recent myocardial infarction
- Severe respiratory disease
- Sick sinus syndrome
- Thyroid disease
- Constrictive pericarditis
- Renal impairment (reduce dose and monitor plasma-digoxin concentration; toxicity increased by electrolyte disturbances)
- Elderly people (reduce dose)
- Concomitant drug therapy with drugs which may increase plasma concentration of digoxin e.g. amiodarone, antimicrobials, calcium-channel blockers, spironolactone

Adverse effects

The adverse effects of digoxin are frequently due to its narrow therapeutic window and include:

- Cardiac adverse effects
  - Sinoatrial and atrioventricular block
  - Premature ventricular contractions
  - PR prolongation and ST-segment depression
- Nausea, vomiting and diarrhoea
- Blurred or yellow vision
- CNS effects
  - weakness, dizziness, confusion, apathy, malaise, headache, depression, psychosis
- Thrombocytopenia and agranulocytosis (rare)
- Gynaecomastia in men in prolonged administration

Digoxin toxicity

Unwanted effects of digoxin depend on both the plasma concentration of digoxin (increasing risk of toxicity through the range 1.5 – 3 mcg/L) and on the sensitivity of the conducting system or of the myocardium, which is often increased in heart disease. Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Care should also be taken in the elderly who are particularly susceptible to digoxin toxicity.

If toxicity occurs, digoxin should be withdrawn. Digoxin-specific antibody fragments are indicated for the treatment of known or strongly suspected life-threatening digoxin toxicity associated with ventricular arrhythmias or bradyarrhythmias unresponsive to atropine sulfate and when measures beyond the withdrawal of digoxin and correction of any electrolyte abnormalities are considered necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 72 of 121

The dose of adenosine must be quartered if given concomitantly in a patient taking which of the following drugs:

a Verapamil

b Dipyridamole

c Thyroxine

d Clopidogrel

e Propranolol

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 72 of 121

The dose of adenosine must be quartered if given concomitantly in a patient taking which of the following drugs:

a) Verapamil ✗
b) Dipyridamole ✓
c) Thyroxine
d) Clopidogrel
e) Propranolol

Answer

The effects of adenosine are potentiated by dipyridamole, therefore if it is essential to give adenosine in a patient taking dipyridamole the dose should be quartered.

Notes

Adenosine is usually the treatment of choice for terminating paroxysmal supraventricular tachycardia including those associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome.

Mechanism of action

Adenosine stimulates A1-adenosine receptors and opens acetylcholine sensitive K+ channels, increasing K+ efflux. This hyperpolarises the cell membrane in the atrioventricular node and, by inhibiting the calcium channels, slows conduction in the AVN. As it has a very short duration of action (half-life only about 8 – 10 seconds), most side effects are short lived.

Administration

For a regular narrow-complex tachycardia the first step is to attempt vagal manoeuvres. If this is unsuccessful and the tachyarrhythmia persists, 6 mg intravenous adenosine should be administered into a central/large vein over 2 seconds, followed by 12 mg after 1 – 2 minutes if required, then a further 12 mg after 1 – 2 minutes if required (max 30 mg).

The effects of adenosine are potentiated by dipyridamole, therefore if it is essential to give adenosine in a patient taking dipyridamole the dose should be quartered.

The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection. If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.

Contraindications

Adenosine is contraindicated in:

- Asthma and COPD (can cause bronchospasm)
- Decompensated heart failure
- Long QT syndrome
- Second- or third-degree AV block and sick sinus syndrome (unless pacemaker fitted)
- Severe hypotension

Adverse effects

Common side effects of adenosine include:

- Apprehension
- Dizziness, flushing, headache, nausea, dyspnoea
- Angina (discontinue)
- AV block, sinus pause and arrhythmia (discontinue if asystole or severe bradycardia occur)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

FRCEMSuccess

MENU

Pharmacology: Cardiovascular

Question 73 of 121

A 67 year old man, with a history of hypertension for which he takes ramipril, presents to ED complaining of palpitations and shortness of breath ongoing for the past 3 days. His HR is 140 bpm and his ECG demonstrates atrial fibrillation. Which of the following is the most appropriate first-line treatment option:

a Rate control with digoxin

b Rate control with a beta-blocker

c Synchronised DC cardioversion

d Chemical cardioversion with amiodarone

e Chemical cardioversion with flecainide

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 73 of 121

A 67 year old man, with a history of hypertension for which he takes ramipril, presents to ED complaining of palpitations and shortness of breath ongoing for the past 3 days. His HR is 140 bpm and his ECG demonstrates atrial fibrillation. Which of the following is the most appropriate first-line treatment option:

a) Rate control with digoxin
b) **Rate control with a beta-blocker** ✔
c) Synchronised DC cardioversion
d) Chemical cardioversion with amiodarone
e) Chemical cardioversion with flecainide

Answer

The longer a person remains in AF, the greater is the likelihood of atrial thrombus developing. In general, people who have been in AF for > 48 h should not be treated by cardioversion (electrical or chemical) until they have been fully anticoagulated for at least 3 weeks, or unless transoesophageal echocardiography has detected no evidence of atrial thrombus. For rate-control, the usual drug of choice is a beta-blocker. Diltiazem may be used in patients in whom beta-blockade is contraindicated or not tolerated. Digoxin may be used in patients with heart failure. Amiodarone may be used to assist with rate control but is most useful in maintaining rhythm control.

Notes

Treatment of patients with atrial fibrillation aims to reduce symptoms and prevent complications, especially stroke. Atrial fibrillation may be managed by either controlling the ventricular rate (rate control) or by attempting to restore and maintain sinus rhythm (rhythm control).

New-onset atrial fibrillation

All patients with adverse features suggesting life-threatening haemodynamic instability (shock, syncope, heart failure, myocardial ischaemia) caused by new onset atrial fibrillation should undergo emergency electrical cardioversion with synchronised DC shock without delaying to achieve anticoagulation.

In patients presenting acutely (< 48 hrs) with new onset AF but without adverse features, immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation).

- For rate-control, the usual drug of choice is a beta-blocker. Diltiazem may be used in patients in whom beta-blockade is contraindicated or not tolerated. Digoxin may be used in patients with heart failure. Amiodarone may be used to assist with rate control but is most useful in maintaining rhythm control.
- For rhythm-control, chemical cardioversion may be appropriate. Class 1c antiarrhythmic drugs such as flecainide or propafenone may be used but are contraindicated in the presence of heart failure, left ventricular impairment, ischaemic heart disease or prolonged QT-interval. Amiodarone (300 mg intravenously over 20 – 60 mins followed by 900 mg over 24 h) may be used to attempt chemical cardioversion but is less often effective and takes longer to act.
- Electrical cardioversion remains an option in this setting and will restore sinus rhythm in more patients than chemical cardioversion.

The longer a person remains in AF, the greater is the likelihood of atrial thrombus developing. In general, people who have been in AF for > 48 h should not be treated by cardioversion (electrical or chemical) until they have been fully anticoagulated for at least 3 weeks, or unless transoesophageal echocardiography has detected no evidence of atrial thrombus.

Long-term management

In general, rate control is the preferred first line drug treatment strategy for atrial fibrillation in most patients except in patients with:

- new onset atrial fibrillation
- heart failure secondary to atrial fibrillation
- atrial flutter suitable for an ablation strategy
- atrial fibrillation with a reversible cause
- or if rhythm control is more suitable based on clinical judgement.

Rate control may be achieved with a beta-blocker or a rate limiting non-dihydropyridine calcium channel blocker e.g. verapamil or diltiazem.

Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation or in combination therapy in resistant cases. Digoxin is also used when atrial fibrillation is accompanied by congestive heart failure.

If symptoms are not controlled with a combination of two drugs, a rhythm-control strategy should be considered.

All patients with AF should be assessed and managed for risk of stroke and thromboembolism, and risk of bleeding if anticoagulation is being considered.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 74 of 121

Which of the following is NOT a common side effect of amiodarone:

a Pulmonary fibrosis

b Peripheral neuropathy

c Blue/green teeth discolouration

d Slate grey skin discolouration

e Corneal microdeposits

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 74 of 121

Which of the following is NOT a common side effect of amiodarone:

a) Pulmonary fibrosis
b) **Peripheral neuropathy** ✗
c) Blue/green teeth discolouration ✓
d) Slate grey skin discolouration
e) Corneal microdeposits

Answer

Common side effects of amiodarone include:

- Bradycardia
- Nausea and vomiting
- Thyroid disorders – hypothyroidism and hyperthyroidism
- Persistent slate grey skin discoloration
- Photosensitivity
- Pulmonary toxicity (including pneumonitis and fibrosis)
- Hepatotoxicity
- Corneal microdeposits (sometimes with night glare)
- Peripheral neuropathy
- Sleep disorders

Notes

Amiodarone hydrochloride is used in the treatment of arrhythmias, particularly when other drugs are ineffective or contraindicated. However, its long-term use is often restricted by serious adverse effects such as photosensitivity, thyroid disorders, corneal microdeposits, neuropathy and pulmonary alveolitis.

Mechanism of action

Amiodarone has blocking actions on several channels (e.g. K+ and inactivated Na+ channels) and beta-adrenoceptors. It acts by slowing repolarisation and prolonging the action potential and refractory period in all cardiac tissues, depressing sinus node automaticity and slowing conduction.

Indications

Amiodarone can be used for paroxysmal supraventricular, nodal and ventricular tachycardias, atrial fibrillation and flutter, and ventricular fibrillation. It can also be used for tachyarrhythmias associated with Wolff-Parkinson- White syndrome.

Intravenous injection of amiodarone hydrochloride can be used in cardiopulmonary resuscitation for ventricular fibrillation or pulseless tachycardia unresponsive to other interventions.

Contraindications

Amiodarone is contraindicated in:

- Severe conduction disturbances (unless pacemaker fitted)
- Sinus node disease (unless pacemaker fitted)
- Iodine sensitivity
- Sinoatrial heart block (except in cardiac arrest)
- Sinus bradycardia (except in cardiac arrest)
- Thyroid dysfunction

Intravenous use should be avoided in cardiomyopathy, congestive heart failure, circulatory collapse, severe arterial hypotension and severe respiratory failure.

Cautions

Amiodarone should be used with caution in:

- Acute porphyrias
- Conduction disturbances (in excessive dosage)
- Elderly
- Heart failure
- Hypokalaemia
- Severe bradycardia (in excessive dosage)
- Severe hepatocellular toxicity
- Concomitant therapy with drugs that prolong the QT interval

Adverse effects

Common side effects of amiodarone include:

- Bradycardia
- Nausea and vomiting
- Thyroid disorders – hypothyroidism and hyperthyroidism
- Persistent slate grey skin discoloration
- Photosensitivity
- Pulmonary toxicity (including pneumonitis and fibrosis)
- Hepatotoxicity
- Corneal microdeposits (sometimes with night glare)
- Peripheral neuropathy
- Sleep disorders

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 75 of 121

What is the mechanism of action of furosemide:

a Inhibition of Na+/Cl- cotransporter

b Inhibition of Na+/K+ ATPase pump

c Aldosterone antagonist

d Inhibition of Na+/K+/2Cl cotransporter

e Osmotic diuretic

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 75 of 121

What is the mechanism of action of furosemide:

a) Inhibition of Na+/Cl- cotransporter
b) Inhibition of Na+/K+ ATPase pump
c) Aldosterone antagonist
d) **Inhibition of Na+/K+/2Cl cotransporter** ✔
e) Osmotic diuretic

Answer

Loop diuretics inhibit the Na+/K+/2Cl- symporter on the luminal membrane in the thick ascending limb of the loop of Henle, thus preventing reabsorption of NaCl and water. These agents reduce reabsorption of Cl- and Na+ and increase Ca2+ excretion and loss of K+ and Mg2+.

Notes

Indications

Loop diuretics are powerful diuretics used in acute pulmonary oedema due to left ventricular failure; intravenous administration produces relief of breathlessness and reduces preload sooner than would be expected from the time of onset of diuresis.

They are also used in oedema in patients with chronic heart failure; diuretic-resistant oedema can be treated with a loop diuretic combined with a thiazide or related diuretic.

If necessary, a loop diuretic can be added to antihypertensive treatment to achieve better control of blood pressure in those with resistant hypertension, or in patients with impaired renal function or heart failure.

Mechanism of action

Loop diuretics inhibit the Na+/K+/2Cl- symporter on the luminal membrane in the thick ascending limb of the loop of Henle, thus preventing reabsorption of NaCl and water. These agents reduce reabsorption of Cl- and Na+ and increase Ca2+ excretion and loss of K+ and Mg2+.

Furosemide and bumetanide are similar in activity; both act within 1 hour of oral administration and diuresis is complete within 6 hours so that, if necessary, they can be given twice in one day without interfering with sleep. Following intravenous administration furosemide has a peak effect within 30 minutes. The diuresis associated with these drugs is dose related.

Contraindications

Loop diuretics are contraindicated in:

- Hypovolaemia and dehydration
- Severe hypokalaemia or severe hyponatraemia
- Anuria, acute kidney injury or chronic kidney disease due to nephrotoxic drugs
- Comatose and pre-comatose states associated with liver cirrhosis

Cautions

Loop diuretics can exacerbate diabetes (but hyperglycaemia is less likely than with thiazides) and gout.

If there is an enlarged prostate, urinary retention can occur, although this is less likely if small doses and less potent diuretics are used initially.

Hypotension, hypovolaemia and electrolyte disturbance should be corrected before initiation of treatment.

Hepatorenal syndrome; hypoproteinaemia may reduce diuretic effect and increase risk of side-effects.

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects.

Adverse effects

Adverse effects of loop diuretics include:

- Mild gastrointestinal disturbances, pancreatitis and hepatic encephalopathy
- Hyperglycaemia
- Acute urinary retention
- Water and electrolyte imbalance
  - Hyponatraemia, hypocalcaemia, hypokalaemia, hypomagnesaemia, hypochloraemia
- Hypotension, hypovolaemia, dehydration, and venous thromboembolism
- Metabolic alkalosis
- Hyperuricaemia
- Blood disorders (bone marrow suppression, thrombocytopenia, and leucopenia)
- Visual disturbance, tinnitus and deafness
- Hypersensitivity reactions

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic.

Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements. In hepatic failure, hypokalaemia caused by diuretics can precipitate encephalopathy, particularly in alcoholic cirrhosis.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 76 of 121

Which of the following drug classes may cause bronchoconstriction:

a Beta-agonists

b Beta-blockers

c Calcium-channel blockers

d Alpha-blocker

e Alpha-agonists

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 76 of 121

Which of the following drug classes may cause bronchoconstriction:

a) Beta-agonists
b) **Beta-blockers** ✔
c) Calcium-channel blockers
d) Alpha-blocker
e) Alpha-agonists

Answer

Beta-blockers, including those considered to be cardioselective, should usually be avoided in patients with a history of asthma, bronchospasm or a history of obstructive airways disease. However, when there is no alternative, a cardioselective beta-blocker can be given to these patients with caution and under specialist supervision. In such cases the risk of inducing bronchospasm should be appreciated and appropriate precautions taken.

Notes

Beta-blockers block the beta-adrenoceptors in the heart, peripheral vasculature, bronchi, pancreas and liver.

Therapeutic effects

- Cardiovascular system
  - Reduce blood pressure
  - Reduce heart rate, contractility and cardiac output
  - Increase AV conduction time, refractoriness and suppress automaticity
- Eye
  - Reduce intraocular pressure
- Respiratory system
  - Cause bronchoconstriction

Type examples

Many beta-blockers are now available and in general they are all equally effective. There are, however, differences between them, which may affect choice in treating particular diseases or individual patients.

Sotalol hydrochloride, a non-cardioselective beta-blocker with additional class III antiarrhythmic activity, is used for prophylaxis in paroxysmal supraventricular arrhythmias. It also suppresses ventricular ectopic beats and nonsustained ventricular tachycardia. It has been shown to be more effective than lidocaine in the termination of spontaneous sustained ventricular tachycardia due to coronary disease or cardiomyopathy. However, it may prolong the QT-interval and induce torsade de pointes in susceptible patients.

Labetalol has, in addition to other beta-blocker effects, an arteriolar vasodilating action by diverse mechanisms, and thus lowers peripheral resistance. Labetalol is useful for treating hypertensive emergencies and in the treatment of hypertension of pheochromocytoma.

Esmolol hydrochloride is a relatively cardioselective beta-blocker with a very short duration of action, used intravenously for the short-term treatment of supraventricular arrhythmias, sinus tachycardia, or hypertension, particularly in the perioperative period.

Indications

Beta-blockers may be indicated in:

- Hypertension
- Pheochromocytoma (only with an alpha-blocker)
- Angina
- Secondary prevention after ACS
- Arrhythmias including atrial fibrillation
- Heart failure
- Thyrotoxicosis
- Anxiety
- Prophylaxis of migraine
- Essential tremor
- Glaucoma

Contraindications

Beta-blockers are contraindicated in people with:

- A history of asthma or bronchospasm.
- Reversible or severe COPD
- Known intolerance or hypersensitivity to beta-blockers
- Severe or symptomatic bradycardia (heart rate less than 60 beats per minute)
- Sinoatrial block, second- or third-degree heart block (unless there is a pacemaker in place)
- Severe or uncontrolled heart failure
- Severe or symptomatic hypotension (systolic blood pressure less than 90 mmHg)
- Severe peripheral arterial disease (including intermittent claudication) or Raynaud's syndrome
- Sick sinus syndrome
- Cardiogenic shock or phaeochromocytoma (without a concomitant alpha-blocker)
- Frequent episodes of hypoglycaemia

Cautions

Beta-blockers should be used with caution in people with:

- Heart failure with chronic kidney disease (CKD), hypotension, ischaemic heart disease, or less severe peripheral arterial disease
- Prinzmetal's angina
- Current or recent (within 4 weeks) exacerbation of heart failure
- First-degree atrioventricular heart block
- Portal hypertension (risk of deterioration in liver function)
- Diabetes mellitus (affects carbohydrate metabolism and symptoms of hypoglycaemia may be masked)
- COPD
- Myasthenia gravis
- Psoriasis
- Thyrotoxicosis (symptoms may be masked)
- People who wear contact lenses (reduced secretion of lacrimal fluid)
- Chronic kidney disease

Adverse effects

- Deteriorating symptoms of heart failure (such as symptoms of fluid overload and fatigue)
- Hypotension and bradycardia
- Dizziness, headache, and syncope
- Nausea, vomiting, diarrhoea, and constipation
- Sexual dysfunction including erectile dysfunction and loss of libido
- Cold extremities, paraesthesia, and numbness (more common in people with peripheral arterial disease)
- Effect on carbohydrate metabolism (hypo- or hyperglycaemia in people with or without diabetes mellitus)
- Effect on metabolic and autonomic response to hypoglycaemia (possible masking of hypoglycaemia warning signs such as tremor and tachycardia)
- Fatigue and asthenia (lack of energy and strength)
- Sleep disturbance, nightmares, and depression
- Bronchospasm
- Reduction of secretion of lacrimal fluid (may affect people who wear contact lenses)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 77 of 121

Which of the following is NOT a predisposing factor for rhabdomyolysis in a patient being considered for statin therapy:

a High alcohol intake

b Concomitant fibrate therapy

c Elderly

d Hyperthyroidism

e Renal impairment

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 77 of 121

Which of the following is NOT a predisposing factor for rhabdomyolysis in a patient being considered for statin therapy:

a) High alcohol intake
b) **Concomitant fibrate therapy** ✖
c) Elderly
d) Hyperthyroidism ✔
e) Renal impairment

Answer

Statins should be used with caution in people:

- With a history of liver disease
- Who consume high level of alcohol
- With predisposing factors for rhabdomyolysis such as older age (> 70 years), concomitant use with an interacting drug, renal impairment, hypothyroidism, and personal or familial history of hereditary muscular disorders

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

Notes

Statins may be used for primary or secondary prevention of cardiovascular disease and for treatment of primary or familial hypercholesterolaemia.

Statins are more effective than other lipid-regulating drugs at lowering LDL-cholesterol concentration but they are less effective than the fibrates in reducing triglyceride concentration. However, statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Mechanism of action

Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase, an enzyme involved in cholesterol synthesis. Inhibition of HMG CoA reductase reduces low-density lipoprotein (LDL) cholesterol levels by slowing down the production of cholesterol in the liver and increasing the liver's ability to remove the LDL cholesterol already in the blood.

Indications

Statins should be offered to all patients, including the elderly, with cardiovascular disease such as those with coronary heart disease (including history of angina or acute myocardial infarction) or occlusive arterial disease (including peripheral vascular disease, non-haemorrhagic stroke, or transient ischaemic attacks). The use of statins should be considered in patients with a high risk of developing cardiovascular disease (primary prevention) which can be assessed using risk calculators.

Contraindications

Statins should be avoided in:

- People with active liver disease
- People with transaminase (alanine aminotransferase or aspartate aminotransferase) levels that are three or more times the upper limit of normal
- Pregnant or breastfeeding women (discontinue 3 months before attempting to conceive)

Cautions

Statins should be used with caution in people:

- With a history of liver disease
- Who consume high level of alcohol
- With predisposing factors for rhabdomyolysis such as older age (> 70 years), concomitant use with an interacting drug, renal impairment, hypothyroidism, and personal or familial history of hereditary muscular disorders

Adverse effects

Adverse effects of statins include:

- Headache
- Epistaxis
- Gastrointestinal disorders (such as constipation, flatulence, dyspepsia, nausea, and diarrhoea)
- Musculoskeletal and connective tissue disorders (such as myalgia, arthralgia, pain in the extremity, muscle spasms, joint swelling, and back pain)
- Hyperglycaemia and diabetes
- Myopathy and rhabdomyolysis
- Interstitial lung disease
- Hepatotoxicity

Muscle effects

The risk of myopathy, myositis, and rhabdomyolysis associated with statin use is rare. Although myalgia has been reported commonly in patients receiving statins, muscle toxicity truly attributable to statin use is rare.

Muscle toxicity can occur with all statins, however the likelihood increases with higher doses and in certain patients. Statins should be used with caution in patients at increased risk of muscle toxicity, including those with a personal or family history of muscular disorders, previous history of muscular toxicity, a high alcohol intake, renal impairment or hypothyroidism.

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 78 of 121

Which of the following is NOT a pharmacological effect of beta-blockers:

a Reduced heart rate

b Reduced blood pressure

c Reduced intraocular pressure

d Reduced cardiac contractility

e Reduced AV conduction time

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 78 of 121

Which of the following is NOT a pharmacological effect of beta-blockers:

a) Reduced heart rate
b) Reduced blood pressure
c) Reduced intraocular pressure
d) Reduced cardiac contractility
e) **Reduced AV conduction time** ✔

Answer

Effects of beta-blockers:

- Cardiovascular system
  - Reduce blood pressure
  - Reduce heart rate, contractility and cardiac output
  - Increase AV conduction time, refractoriness and suppress automaticity
- Eye
  - Reduce intraocular pressure
- Respiratory system
  - Cause bronchoconstriction

Notes

Beta-blockers block the beta-adrenoceptors in the heart, peripheral vasculature, bronchi, pancreas and liver.

Therapeutic effects

- Cardiovascular system
  - Reduce blood pressure
  - Reduce heart rate, contractility and cardiac output
  - Increase AV conduction time, refractoriness and suppress automaticity
- Eye
  - Reduce intraocular pressure
- Respiratory system
  - Cause bronchoconstriction

Type examples

Many beta-blockers are now available and in general they are all equally effective. There are, however, differences between them, which may affect choice in treating particular diseases or individual patients.

Sotalol hydrochloride, a non-cardioselective beta-blocker with additional class III antiarrhythmic activity, is used for prophylaxis in paroxysmal supraventricular arrhythmias. It also suppresses ventricular ectopic beats and nonsustained ventricular tachycardia. It has been shown to be more effective than lidocaine in the termination of spontaneous sustained ventricular tachycardia due to coronary disease or cardiomyopathy. However, it may prolong the QT-interval and induce torsade de pointes in susceptible patients.

Labetalol has, in addition to other beta-blocker effects, an arteriolar vasodilating action by diverse mechanisms, and thus lowers peripheral resistance. Labetalol is useful for treating hypertensive emergencies and in the treatment of hypertension of pheochromocytoma.

Esmolol hydrochloride is a relatively cardioselective beta-blocker with a very short duration of action, used intravenously for the short-term treatment of supraventricular arrhythmias, sinus tachycardia, or hypertension, particularly in the perioperative period.

Indications

Beta-blockers may be indicated in:

- Hypertension
- Pheochromocytoma (only with an alpha-blocker)
- Angina
- Secondary prevention after ACS
- Arrhythmias including atrial fibrillation
- Heart failure
- Thyrotoxicosis
- Anxiety
- Prophylaxis of migraine
- Essential tremor
- Glaucoma

Contraindications

Beta-blockers are contraindicated in people with:

- A history of asthma or bronchospasm.
- Reversible or severe COPD
- Known intolerance or hypersensitivity to beta-blockers
- Severe or symptomatic bradycardia (heart rate less than 60 beats per minute)
- Sinoatrial block, second- or third-degree heart block (unless there is a pacemaker in place)
- Severe or uncontrolled heart failure
- Severe or symptomatic hypotension (systolic blood pressure less than 90 mmHg)
- Severe peripheral arterial disease (including intermittent claudication) or Raynaud's syndrome
- Sick sinus syndrome
- Cardiogenic shock or phaeochromocytoma (without a concomitant alpha-blocker)
- Frequent episodes of hypoglycaemia

Cautions

Beta-blockers should be used with caution in people with:

- Heart failure with chronic kidney disease (CKD), hypotension, ischaemic heart disease, or less severe peripheral arterial disease
- Prinzmetal's angina
- Current or recent (within 4 weeks) exacerbation of heart failure
- First-degree atrioventricular heart block
- Portal hypertension (risk of deterioration in liver function)
- Diabetes mellitus (affects carbohydrate metabolism and symptoms of hypoglycaemia may be masked)
- COPD
- Myasthenia gravis
- Psoriasis
- Thyrotoxicosis (symptoms may be masked)
- People who wear contact lenses (reduced secretion of lacrimal fluid)
- Chronic kidney disease

Adverse effects

- Deteriorating symptoms of heart failure (such as symptoms of fluid overload and fatigue)
- Hypotension and bradycardia
- Dizziness, headache, and syncope
- Nausea, vomiting, diarrhoea, and constipation
- Sexual dysfunction including erectile dysfunction and loss of libido
- Cold extremities, paraesthesia, and numbness (more common in people with peripheral arterial disease)
- Effect on carbohydrate metabolism (hypo- or hyperglycaemia in people with or without diabetes mellitus)
- Effect on metabolic and autonomic response to hypoglycaemia (possible masking of hypoglycaemia warning signs such as tremor and tachycardia)
- Fatigue and asthenia (lack of energy and strength)
- Sleep disturbance, nightmares, and depression
- Bronchospasm
- Reduction of secretion of lacrimal fluid (may affect people who wear contact lenses)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 79 of 121

In adult advanced life support, which of the following best describes the correct administration of adrenaline for a non-shockable rhythm:

a Give 1 mg of adrenaline as soon as intravenous access is achieved and every 3 – 5 minutes thereafter

b Give 0.5 mg of adrenaline as soon as intravenous access is achieved and every 2 – 4 minutes thereafter

c Give 1 mg of adrenaline after 2 minutes of compressions and every 3 – 5 minutes thereafter

d Give 1 mg of adrenaline as soon as intravenous access is achieved and every 10 minutes thereafter

e Give 0.5 mg of adrenaline as soon as intravenous access is achieved and every 3 – 5 minutes thereafter

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 79 of 121

In adult advanced life support, which of the following best describes the correct administration of adrenaline for a non-shockable rhythm:

a) ✔
Give 1 mg of adrenaline as soon as intravenous access is achieved and every 3 – 5 minutes thereafter

b)
Give 0.5 mg of adrenaline as soon as intravenous access is achieved and every 2 – 4 minutes thereafter

c) Give 1 mg of adrenaline after 2 minutes of compressions and every 3 – 5 minutes thereafter

d) Give 1 mg of adrenaline as soon as intravenous access is achieved and every 10 minutes thereafter

e)
Give 0.5 mg of adrenaline as soon as intravenous access is achieved and every 3 – 5 minutes thereafter

Answer

IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

Notes

Basic life support

- For chest compressions in adult basic life support the heel of one hand should be placed over the middle of the lower half of the patient's sternum with the other hand on top.
- The sternum should be depressed to a depth of 5 – 6 cm.
- Chest compressions should be performed at a rate of 100 – 120 per minute.
- Thirty compressions should be given before two breaths and that ratio continued (30:2).
- The person giving CPR should be changed every 2 minutes if possible to avoid exhaustion and poor quality chest compressions.
- Interruptions should be minimised (pauses should be < 5 seconds).

Advanced life support

- In adult advanced life support, basic life support should continue whilst the defibrillator pads are attached and the airway managed.
- The pads should be positioned one to the right of the upper sternum below the clavicle and the other in the left midaxillary line in the 5th intercostal space.
- Chest compressions should be paused briefly (< 5 secs) to assess the rhythm and then continued as the defibrillator charges if a shockable rhythm is identified or continued for a further two whole minutes if a non-shockable rhythm is identified.
- When delivering a shock, everybody should be clear of the patient (and any GTN patches and oxygen sources removed).
- Once the shock has been delivered, compressions should resume immediately and continue for a further two minutes before checking the rhythm again or feeling for a pulse.

Shockable rhythm (ventricular fibrillation or pulseless ventricular tachycardia)

- IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter.
- IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Non-shockable rhythm (asystole or pulseless electrical activity)

- IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 80 of 121

Regarding alteplase, which of the following statements is INCORRECT:

a Alteplase is a recombinant tissue-type plasminogen activator.

b Alteplase has selectivity for activation of fibrin-bound plasminogen.

c Alteplase has a half-life of about 3 – 4 minutes.

d Alteplase is commonly associated with hypotensive effects.

e Alteplase must be given by continuous intravenous infusion.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 80 of 121

Regarding alteplase, which of the following statements is INCORRECT:

a) Alteplase is a recombinant tissue-type plasminogen activator.
b) Alteplase has selectivity for activation of fibrin-bound plasminogen.
c) Alteplase has a half-life of about 3 – 4 minutes.
d) Alteplase is commonly associated with hypotensive effects. ✔
e) **Alteplase must be given by continuous intravenous infusion.** ✖

Answer

Alteplase is a recombinant tissue-type plasminogen activator (tPA), a naturally occurring fibrin-specific enzyme that has selectivity for activation of fibrin-bound plasminogen. It has a short half-life of 3 – 4 minutes and must be given by continuous intravenous infusion but is not associated with antigenic or hypotensive effects, and can be used in patients when recent streptococcal infections or recent use of streptokinase contraindicates the use of streptokinase.

Notes

The value of thrombolytic drugs for the treatment of myocardial infarction has been established. Streptokinase and alteplase have been shown to reduce mortality. Reteplase and tenecteplase are also licensed for acute myocardial infarction. Fibrinolytic therapy carries a risk of bleeding, including cerebral haemorrhage, and not all patients can be given this treatment safely.

Mechanism of action

Fibrinolytic drugs act as thrombolytics by activating plasminogen to form plasmin, which degrades fibrin and so breaks up thrombi.

Alteplase should be given within 6 – 12 hours of symptom onset, reteplase and streptokinase within 12 hours of symptom onset, but ideally all should be given within 1 hour; use after 12 hours requires specialist advice.

Contraindications

- Absolute
  - Previous haemorrhagic stroke
  - Ischaemic stroke during the previous 6 months
  - Central nervous system damage or neoplasm
  - Recent (within 3 weeks) major surgery, head injury or other major trauma
  - Active internal bleeding or gastrointestinal bleeding within the past month
  - Known bleeding disorder
- Relative
  - Refractory hypertension (SBP > 180 mmHg)
  - Transient ischaemic attack during the previous 6 months
  - Oral anticoagulant treatment
  - Pregnancy or less than 1 week postpartum
  - Traumatic CPR
  - Non-compressive vascular puncture
  - Active peptic ulcer disease
  - Advanced liver disease
  - Infective endocarditis
  - Previous allergic reaction to fibrinolytic drug to be used

Adverse effects

- Bleeding (serious bleeding calls for discontinuation of the thrombolytic and may require administration of coagulation factors and antifibrinolytic drugs)
- Nausea and vomiting
- Further embolism (either due to clots that break away from the original thrombus or to cholesterol crystal emboli)
- Hypotension
- Hypersensitivity reactions

Streptokinase

Streptokinase (SK) is a single chain polypeptide, derived from beta-haemolytic streptococci. Its lack of fibrin specificity makes it a less desirable thrombolytic drug than tPA compounds because it produces more fibrinogenolysis. Streptokinase is antigenic, and so should not be given to patients who have already been exposed, due to the development of antibodies (after about 4 – 5 days). Prolonged persistence of antibodies to streptokinase can reduce the effectiveness of subsequent treatment; therefore, streptokinase should not be used again beyond 4 days of first administration of streptokinase. Minor allergic reactions may occur in up to 10% of patients – anaphylaxis occurs in less than 0.5% of cases. Hypotension may occur during infusion which usually responds to fluids or slowing of the infusion.

Alteplase

Alteplase is a recombinant tissue-type plasminogen activator (tPA), a naturally occurring fibrin-specific enzyme that has selectivity for activation of fibrin-bound plasminogen. It has a short half-life of 3 – 4 minutes and must be given by continuous intravenous infusion but is not associated with antigenic or hypotensive effects, and can be used in patients when recent streptococcal infections or recent use of streptokinase contraindicates the use of streptokinase.

Reteplase and tenecteplase

Reteplase and tenecteplase are genetically engineered forms of human tPA and have a longer half-life, higher specificity for fibrin, and greater resistance to plasminogen activator inhibitor-1 than native tPA. The increase in half-life permits administration as a bolus rather than by continuous infusion.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 81 of 121

Which of the following is NOT an adverse effect of bendroflumethiazide:

a Hyperglycaemia

b Hyperlipidaemia

c Adrenal suppression

d Postural hypotension

e Hyperuricaemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 81 of 121

Which of the following is NOT an adverse effect of bendroflumethiazide:

a) Hyperglycaemia
b) **Hyperlipidaemia** ✗
c) Adrenal suppression ✓
d) Postural hypotension
e) Hyperuricaemia

Answer

Common side effects of thiazide diuretics include:

- Excessive diuresis
  - Postural hypotension, dehydration, renal impairment
- Acid-base and electrolyte imbalance
  - Hypokalaemia, hyponatraemia, hypomagnesaemia, hypercalcaemia, hypochloraemic alkalosis
- Metabolic imbalance
  - Hyperuricaemia and gout
  - Impaired glucose tolerance and hyperglycaemia
  - Altered plasma-lipid concentrations
- Mild gastrointestinal disturbances

Notes

Thiazide diuretics are moderately potent diuretics, and are used to relieve oedema in chronic heart failure, and in the management of hypertension. They act within 1 to 2 hours of oral administration and most have a duration of action of 12 to 24 hours.

Mechanism of action

Thiazides act mainly on the early segments of distal tubule where they inhibit NaCl reabsorption by binding to the the Na+/Cl- cotransporter. Excretion of Cl-, Na+ and accompanying water is increased. The increased Na+ load in the distal tubule stimulates Na+ exchange with K+ and H+, increasing their excretion and causing hypokalaemia and a metabolic alkalosis. Excretion of Ca2+ is reduced.

Indications

Bendroflumethiazide is used for oedema in mild or moderate heart failure. Combination diuretic therapy (with loop and thiazide diuretics) may be effective in patients with oedema resistant to treatment with one diuretic.

Thiazide diuretics are licensed for the treatment of hypertension but are no longer considered the first line diuretic for this indication. In the management of hypertension a low dose of a thiazide produces a maximal or near-maximal blood pressure lowering effect, with very little biochemical disturbance. Higher doses cause more marked changes in plasma potassium, sodium, uric acid, glucose, and lipids, with little advantage in blood pressure control.

Contraindications

Thiazide diuretics are contraindicated in:

- Addison's disease
- Hypercalcaemia
- Hyponatraemia
- Refractory hypokalaemia
- Symptomatic hyperuricaemia
- Severe hepatic impairment (may precipitate encephalopathy)

Cautions

Thiazide diuretics should be used with caution in:

- Diabetes mellitus (may exacerbate)
- Gout (may exacerbate)
- Systemic lupus erythematosus (may exacerbate)
- Hyperaldosteronism
- Malnourishment
- Nephrotic syndrome

Adverse effects

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects. The dose should then be adjusted according to renal function.

Common side effects of thiazide diuretics include:

- Excessive diuresis
  - Postural hypotension, dehydration, renal impairment
- Acid-base and electrolyte imbalance
  - Hypokalaemia, hyponatraemia, hypomagnesaemia, hypercalcaemia, hypochloraemic alkalosis
- Metabolic imbalance
  - Hyperuricaemia and gout
  - Impaired glucose tolerance and hyperglycaemia
  - Altered plasma-lipid concentrations
- Mild gastrointestinal disturbances

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic. Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 82 of 121

Unfractionated heparin therapy is monitored using which of the following:

a International normalised ratio (INR)

b Prothrombin time (PT)

c Activated partial thromboplastin time (APTT)

d Activated clotting time (ACT)

e Bleeding time

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 82 of 121

Unfractionated heparin therapy is monitored using which of the following:

a) International normalised ratio (INR)
b) Prothrombin time (PT)
c) **Activated partial thromboplastin time (APTT)** ✔
d) Activated clotting time (ACT)
e) Bleeding time

Answer

Unfractionated heparin is usually given by continuous intravenous infusion for the smoothest control and is the treatment of choice where rapid reversal of anticoagulation may be required (e.g. in surgical patients or late pregnancy). Therapy is monitored by maintaining the activated partial thromboplastin time (APTT) at 1.5 – 2.5 times the upper limit of normal.

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Heparin potentiates the activity of antithrombin III, causing inactivation of thrombin. The heparin-antithrombin III complex also inhibits factor Xa and some other factors. Low molecular weight heparin (LMWH) preparations inhibit only factor Xa. PT and APTT may both be prolonged but the PT less so.

Contraindications

Heparins are contraindicated:

- In people with current (or history of) heparin-induced thrombocytopenia
- In people with acute bacterial endocarditis
- In people with active major bleeding, and conditions with a high risk of uncontrolled bleeding, including recent haemorrhagic stroke, major trauma, recent brain, spinal cord or eye surgery, haemophilia and thrombocytopenia
- In people with active gastric or duodenal ulceration

Adverse effects

- Bleeding
- Heparin-induced thrombocytopenia (immune-mediated effect that usually develops after 5 – 10 days, signs may include a 30% reduction of platelet count, thrombosis, or skin allergy; if HIT is suspected or confirmed, heparin should be discontinued and an alternative anticoagulant given)
- Hyperkalaemia (due to inhibition of aldosterone secretion; patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium or those taking potassium-sparing drugs seem to be more susceptible)
- Osteoporosis (risk lower with LMWH)
- Alopecia
- Hypersensitivity reactions
- Injection site reactions

Low molecular weight heparin vs unfractionated heparin

Unfractionated heparin is usually given by continuous intravenous infusion for the smoothest control and is the treatment of choice where rapid reversal of anticoagulation may be required (e.g. in surgical patients or late pregnancy). Therapy is monitored by maintaining the APTT at 1.5 – 2.5 times the upper limit of normal.

Low molecular weight heparin (LMWH) preparations have largely replaced unfractionated heparin.

Advantages of LMWH
Greater ability to inhibit factor Xa directly, interacting less with platelets and so may have a lesser tendency to cause bleeding
Greater bioavailability and longer half-life in plasma making once daily subcutaneous administration possible
More predictable dose response avoiding the need for routine anticoagulant monitoring
Lower associated risk of heparin-induced thrombocytopenia or of osteoporosis

Haemorrhage

Because it has a short duration of action, if haemorrhage occurs it is usually sufficient to withdraw unfractionated or low molecular weight heparin, but if rapid reversal of the effects of the heparin is required, protamine sulfate is a specific antidote (but only partially reverses the effects of low molecular weight heparins).

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 83 of 121

Which of the following is NOT a typical side effect of beta-blockers:

a Bronchospasm

b Tachycardia

c Cold extremities

d Hyperglycaemia

e Hypoglycaemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 83 of 121

Which of the following is NOT a typical side effect of beta-blockers:

a) Bronchospasm
b) **Tachycardia** ✔
c) Cold extremities
d) Hyperglycaemia
e) Hypoglycaemia

Answer

Side effects of beta-blockers include:

- Deteriorating symptoms of heart failure (such as symptoms of fluid overload and fatigue)
- Hypotension and bradycardia
- Dizziness, headache, and syncope
- Nausea, vomiting, diarrhoea, and constipation
- Sexual dysfunction including erectile dysfunction and loss of libido
- Cold extremities, paraesthesia, and numbness (more common in people with peripheral arterial disease)
- Effect on carbohydrate metabolism (hypo- or hyperglycaemia in people with or without diabetes mellitus)
- Effect on metabolic and autonomic response to hypoglycaemia (possible masking of hypoglycaemia warning signs such as tremor and tachycardia)
- Fatigue and asthenia (lack of energy and strength)
- Sleep disturbance, nightmares, and depression
- Bronchospasm
- Reduction of secretion of lacrimal fluid (may affect people who wear contact lenses)

Notes

Beta-blockers block the beta-adrenoceptors in the heart, peripheral vasculature, bronchi, pancreas and liver.

Therapeutic effects

- Cardiovascular system
  - Reduce blood pressure
  - Reduce heart rate, contractility and cardiac output
  - Increase AV conduction time, refractoriness and suppress automaticity
- Eye
  - Reduce intraocular pressure
- Respiratory system
  - Cause bronchoconstriction

Type examples

Many beta-blockers are now available and in general they are all equally effective. There are, however, differences between them, which may affect choice in treating particular diseases or individual patients.

Sotalol hydrochloride, a non-cardioselective beta-blocker with additional class III antiarrhythmic activity, is used for prophylaxis in paroxysmal supraventricular arrhythmias. It also suppresses ventricular ectopic beats and nonsustained ventricular tachycardia. It has been shown to be more effective than lidocaine in the termination of spontaneous sustained ventricular tachycardia due to coronary disease or cardiomyopathy. However, it may prolong the QT-interval and induce torsade de pointes in susceptible patients.

Labetalol has, in addition to other beta-blocker effects, an arteriolar vasodilating action by diverse mechanisms, and thus lowers peripheral resistance. Labetalol is useful for treating hypertensive emergencies and in the treatment of hypertension of pheochromocytoma.

Esmolol hydrochloride is a relatively cardioselective beta-blocker with a very short duration of action, used intravenously for the short-term treatment of supraventricular arrhythmias, sinus tachycardia, or hypertension, particularly in the perioperative period.

Indications

Beta-blockers may be indicated in:

- Hypertension
- Pheochromocytoma (only with an alpha-blocker)
- Angina
- Secondary prevention after ACS
- Arrhythmias including atrial fibrillation
- Heart failure
- Thyrotoxicosis
- Anxiety
- Prophylaxis of migraine
- Essential tremor
- Glaucoma

Contraindications

Beta-blockers are contraindicated in people with:

- A history of asthma or bronchospasm.
- Reversible or severe COPD
- Known intolerance or hypersensitivity to beta-blockers
- Severe or symptomatic bradycardia (heart rate less than 60 beats per minute)
- Sinoatrial block, second- or third-degree heart block (unless there is a pacemaker in place)
- Severe or uncontrolled heart failure
- Severe or symptomatic hypotension (systolic blood pressure less than 90 mmHg)
- Severe peripheral arterial disease (including intermittent claudication) or Raynaud's syndrome
- Sick sinus syndrome
- Cardiogenic shock or phaeochromocytoma (without a concomitant alpha-blocker)
- Frequent episodes of hypoglycaemia

Cautions

Beta-blockers should be used with caution in people with:

- Heart failure with chronic kidney disease (CKD), hypotension, ischaemic heart disease, or less severe peripheral arterial disease
- Prinzmetal's angina
- Current or recent (within 4 weeks) exacerbation of heart failure
- First-degree atrioventricular heart block
- Portal hypertension (risk of deterioration in liver function)
- Diabetes mellitus (affects carbohydrate metabolism and symptoms of hypoglycaemia may be masked)
- COPD
- Myasthenia gravis
- Psoriasis
- Thyrotoxicosis (symptoms may be masked)
- People who wear contact lenses (reduced secretion of lacrimal fluid)
- Chronic kidney disease

Adverse effects

- Deteriorating symptoms of heart failure (such as symptoms of fluid overload and fatigue)
- Hypotension and bradycardia
- Dizziness, headache, and syncope
- Nausea, vomiting, diarrhoea, and constipation
- Sexual dysfunction including erectile dysfunction and loss of libido
- Cold extremities, paraesthesia, and numbness (more common in people with peripheral arterial disease)
- Effect on carbohydrate metabolism (hypo- or hyperglycaemia in people with or without diabetes mellitus)
- Effect on metabolic and autonomic response to hypoglycaemia (possible masking of hypoglycaemia warning signs such as tremor and tachycardia)
- Fatigue and asthenia (lack of energy and strength)
- Sleep disturbance, nightmares, and depression
- Bronchospasm
- Reduction of secretion of lacrimal fluid (may affect people who wear contact lenses)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 84 of 121

Regarding fibrinolytics, which of the following statements is INCORRECT:

a Serious bleeding may occur which may require the administration of coagulation factors and antifibrinolytic drugs.

b Reteplase is a genetically engineered form of human tPA.

c Tenecteplase has a longer half-life than alteplase allowing for bolus administration.

d Fibrinolytic drugs act as thrombolytics by directly degrading the fibrin mesh and so breaking up thrombi.

e Further embolism may occur either due to clots that break away from the original thrombus or to cholesterol crystal emboli.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 84 of 121

Regarding fibrinolytics, which of the following statements is INCORRECT:

a)
Serious bleeding may occur which may require the administration of coagulation factors and antifibrinolytic drugs.

b) Reteplase is a genetically engineered form of human tPA.

c) Tenecteplase has a longer half-life than alteplase allowing for bolus administration.

d) ✔
Fibrinolytic drugs act as thrombolytics by directly degrading the fibrin mesh and so breaking up thrombi.

e) ✖
Further embolism may occur either due to clots that break away from the original thrombus or to cholesterol crystal emboli.

Answer

Fibrinolytic drugs act as thrombolytics by activating plasminogen to form plasmin, which degrades fibrin and so breaks up thrombi.

Notes

The value of thrombolytic drugs for the treatment of myocardial infarction has been established. Streptokinase and alteplase have been shown to reduce mortality. Reteplase and tenecteplase are also licensed for acute myocardial infarction. Fibrinolytic therapy carries a risk of bleeding, including cerebral haemorrhage, and not all patients can be given this treatment safely.

Mechanism of action

Fibrinolytic drugs act as thrombolytics by activating plasminogen to form plasmin, which degrades fibrin and so breaks up thrombi.

Alteplase should be given within 6 – 12 hours of symptom onset, reteplase and streptokinase within 12 hours of symptom onset, but ideally all should be given within 1 hour; use after 12 hours requires specialist advice.

Contraindications

- Absolute
  - Previous haemorrhagic stroke
  - Ischaemic stroke during the previous 6 months
  - Central nervous system damage or neoplasm
  - Recent (within 3 weeks) major surgery, head injury or other major trauma
  - Active internal bleeding or gastrointestinal bleeding within the past month
  - Known bleeding disorder
- Relative
  - Refractory hypertension (SBP > 180 mmHg)
  - Transient ischaemic attack during the previous 6 months
  - Oral anticoagulant treatment
  - Pregnancy or less than 1 week postpartum
  - Traumatic CPR
  - Non-compressive vascular puncture
  - Active peptic ulcer disease
  - Advanced liver disease
  - Infective endocarditis
  - Previous allergic reaction to fibrinolytic drug to be used

Adverse effects

- Bleeding (serious bleeding calls for discontinuation of the thrombolytic and may require administration of coagulation factors and antifibrinolytic drugs)
- Nausea and vomiting
- Further embolism (either due to clots that break away from the original thrombus or to cholesterol crystal emboli)
- Hypotension
- Hypersensitivity reactions

Streptokinase

Streptokinase (SK) is a single chain polypeptide, derived from beta-haemolytic streptococci. Its lack of fibrin specificity makes it a less desirable thrombolytic drug than tPA compounds because it produces more fibrinogenolysis. Streptokinase is antigenic, and so should not be given to patients who have already been exposed, due to the development of antibodies (after about 4 – 5 days). Prolonged persistence of antibodies to streptokinase can reduce the effectiveness of subsequent treatment; therefore, streptokinase should not be used again beyond 4 days of first administration of streptokinase. Minor allergic reactions may occur in up to 10% of patients – anaphylaxis occurs in less than 0.5% of cases. Hypotension may occur during infusion which usually responds to fluids or slowing of the infusion.

Alteplase

Alteplase is a recombinant tissue-type plasminogen activator (tPA), a naturally occurring fibrin-specific enzyme that has selectivity for activation of fibrin-bound plasminogen. It has a short half-life of 3 – 4 minutes and must be given by continuous intravenous infusion but is not associated with antigenic or hypotensive effects, and can be used in patients when recent streptococcal infections or recent use of streptokinase contraindicates the use of streptokinase.

Reteplase and tenecteplase

Reteplase and tenecteplase are genetically engineered forms of human tPA and have a longer half-life, higher specificity for fibrin, and greater resistance to plasminogen activator inhibitor-1 than native tPA. The increase in half-life permits administration as a bolus rather than by continuous infusion.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 85 of 121

Regarding nitrates, which of the following statements is INCORRECT:

a The effects of sublingual GTN last for about 20 – 30 minutes.

b Nitrates act as potent coronary vasodilators.

c Nitrates act to decrease venous return.

d Prolonged high dosage may cause methaemoglobinaemia as a result of oxidation of haemoglobin.

e Nitrates act by decreasing intracellular cGMP levels causing vascular smooth muscle relaxation.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 85 of 121

Regarding nitrates, which of the following statements is INCORRECT:

a) The effects of sublingual GTN last for about 20 – 30 minutes.
b) Nitrates act as potent coronary vasodilators.
c) Nitrates act to decrease venous return.
d) ✖
Prolonged high dosage may cause methaemoglobinaemia as a result of oxidation of haemoglobin.
e) Nitrates act by decreasing intracellular cGMP levels causing vascular smooth muscle relaxation. ✔

Answer

Initial metabolism of these drugs releases nitrite ions, which undergoes intracellular conversion to nitric oxide (NO). Nitric oxide then activates guanylyl cyclase, causing an increase in the intracellular concentration of cGMP in the vascular smooth muscle cells. cGMP activates protein kinase G, an enzyme that ultimately causes vascular smooth muscle relaxation.

Notes

Nitrates are useful in the management of angina. Although they are potent coronary vasodilators, the main benefit derives from a reduction in venous return which in turn reduces left ventricular effort, decreasing oxygen demands and relieving anginal pain.

Vasodilators can also act in heart failure by arteriolar dilatation which reduces both peripheral vascular resistance and left ventricular pressure during systole resulting in improved cardiac output. They can also cause venous dilatation which results in dilatation of capacitance vessels, increase of venous pooling, and diminution of venous return to the heart (decreasing left ventricular end-diastolic pressure).

Mechanism of action

Initial metabolism of these drugs releases nitrite ions, which undergoes intracellular conversion to nitric oxide (NO). Nitric oxide then activates guanylyl cyclase, causing an increase in the intracellular concentration of cGMP in the vascular smooth muscle cells. cGMP activates protein kinase G, an enzyme that ultimately causes vascular smooth muscle relaxation.

Type examples

Sublingual glyceryl trinitrate (GTN) is one of the most effective drugs for providing rapid relief of angina, although its effects only last for 20 – 30 minutes. It may be administered as sublingual tablets or by sublingual administration using aerosol spray.

If sublingual glyceryl trinitrate is required more than twice a week, then combined therapy is required, where beta-blockers or calcium-channel blockers are taken in addition to nitrates which are reserved for acute attacks. If necessary, a long-acting nitrate is added.

Long-acting nitrates are more stable and may be effective for several hours, depending on the drug and the preparation (sublingual, oral, modified release). Isosorbide dinitrate is widely used; duration of action of up to 12 hours is claimed for modified-release preparations. The use of isosorbide mononitrate, which is the main active metabolite of the dinitrate, avoids the variable absorption and unpredictable first-pass metabolism of the dinitrate.

Glyceryl trinitrate or isosorbide dinitrate may be tried by intravenous injection when the sublingual form is ineffective in patients with chest pain due to myocardial infarction or severe ischaemia. Intravenous injections are also useful in the treatment of congestive heart failure.

Adverse effects

Side effects such as dizziness, flushing, tachycardia, throbbing headache and postural hypotension may limit therapy, especially when angina is severe or when patients are unusually sensitive to the effects of nitrates. Prolonged high dosage may cause methaemoglobinaemia as a result of oxidation of haemoglobin.

Contraindications

Nitrates should not be used in people with:

- Acute myocardial infarction (MI) with low filling pressure, acute circulatory failure, (shock, vascular collapse), or very low blood pressure
- Hypertrophic obstructive cardiomyopathy (HOCM), constrictive pericarditis, cardiac tamponade, low cardiac filling pressures, or aortic/mitral valve stenosis
- Diseases associated with a raised intracranial pressure (for example following a head trauma, including cerebral haemorrhage)
- Severe anaemia
- Closed angle glaucoma
- Severe hypotension, or hypovolaemia

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 86 of 121

Regarding heparin, which of the following statements is CORRECT:

a Unfractionated heparin must be monitored using the prothrombin time (PT).

b Unfractionated heparin is usually given subcutaneously.

c Heparin is contraindicated in pregnancy.

d Protamine sulphate completely reverses the effects of low molecular weight heparin (LMWH).

e Heparin is associated with a risk of hyperkalaemia due to inhibition of aldosterone secretion.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 86 of 121

Regarding heparin, which of the following statements is CORRECT:

a) Unfractionated heparin must be monitored using the prothrombin time (PT).
b) Unfractionated heparin is usually given subcutaneously.
c) Heparin is contraindicated in pregnancy.
d) Protamine sulphate completely reverses the effects of low molecular weight heparin (LMWH).
e)

Heparin is associated with a risk of hyperkalaemia due to inhibition of aldosterone secretion.

Answer

Heparin can cause hyperkalaemia due to inhibition of aldosterone secretion; patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium or those taking potassium-sparing drugs seem to be more susceptible. Plasma-potassium concentration should be measured in patients at risk of hyperkalaemia before starting the heparin and monitored regularly thereafter, particularly if treatment is to be continued for longer than 7 days.

Protamine sulphate only partially reverses the effects of LMWH. Heparin does not cross the placenta and is not contraindicated in pregnancy. Unfractionated heparin therapy is usually given by continuous intravenous infusion for the smoothest control and monitored using the APTT.

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Heparin potentiates the activity of antithrombin III, causing inactivation of thrombin. The heparin-antithrombin III complex also inhibits factor Xa and some other factors. Low molecular weight heparin (LMWH) preparations inhibit only factor Xa. PT and APTT may both be prolonged but the PT less so.

Contraindications

Heparins are contraindicated:

- In people with current (or history of) heparin-induced thrombocytopenia
- In people with acute bacterial endocarditis
- In people with active major bleeding, and conditions with a high risk of uncontrolled bleeding, including recent haemorrhagic stroke, major trauma, recent brain, spinal cord or eye surgery, haemophilia and thrombocytopenia
- In people with active gastric or duodenal ulceration

Adverse effects

- Bleeding
- Heparin-induced thrombocytopenia (immune-mediated effect that usually develops after 5 – 10 days, signs may include a 30% reduction of platelet count, thrombosis, or skin allergy; if HIT is suspected or confirmed, heparin should be discontinued and an alternative anticoagulant given)
- Hyperkalaemia (due to inhibition of aldosterone secretion; patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium or those taking potassium-sparing drugs seem to be more susceptible)
- Osteoporosis (risk lower with LMWH)
- Alopecia
- Hypersensitivity reactions
- Injection site reactions

Low molecular weight heparin vs unfractionated heparin

Unfractionated heparin is usually given by continuous intravenous infusion for the smoothest control and is the treatment of choice where rapid reversal of anticoagulation may be required (e.g. in surgical patients or late pregnancy). Therapy is monitored by maintaining the APTT at 1.5 – 2.5 times the upper limit of normal.

Low molecular weight heparin (LMWH) preparations have largely replaced unfractionated heparin.

Advantages of LMWH
Greater ability to inhibit factor Xa directly, interacting less with platelets and so may have a lesser tendency to cause bleeding
Greater bioavailability and longer half-life in plasma making once daily subcutaneous administration possible
More predictable dose response avoiding the need for routine anticoagulant monitoring
Lower associated risk of heparin-induced thrombocytopenia or of osteoporosis

Haemorrhage

Because it has a short duration of action, if haemorrhage occurs it is usually sufficient to withdraw unfractionated or low molecular weight heparin, but if rapid reversal of the effects of the heparin is required, protamine sulfate is a specific antidote (but only partially reverses the effects of low molecular weight heparins).

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 87 of 121

What is the mechanism of action of captopril:

a Inhibition of the conversion of angiotensinogen to angiotensin

b Inhibition of the breakdown of angiotensin II

c Inhibition of the conversion of angiotensin I to angiotensin II

d Direct inhibition of aldosterone release

e Blockage of angiotensin II receptors

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 87 of 121

What is the mechanism of action of captopril:

a) Inhibition of the conversion of angiotensinogen to angiotensin
b) Inhibition of the breakdown of angiotensin II
c) **Inhibition of the conversion of angiotensin I to angiotensin II** ✔
d) Direct inhibition of aldosterone release
e) Blockage of angiotensin II receptors

Answer

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 88 of 121

In adult advanced life support, the defibrillator pads should be placed at which of the following positions:

a One to the left of the upper sternum below the clavicle and one in the left midaxillary line in the 5th intercostal space

b One to the right of the upper sternum below the clavicle and one in the left midaxillary line in the 3rd intercostal space

c One to the right of the upper sternum below the clavicle and one in the left midaxillary line in the 5th intercostal space

d One to the left of the upper sternum below the clavicle and one in the left midaxillary line in the 3rd intercostal space

e One to the right of the lower sternum and one in the left midaxillary line in the 4th intercostal space

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 88 of 121

In adult advanced life support, the defibrillator pads should be placed at which of the following positions:

a)
One to the left of the upper sternum below the clavicle and one in the left midaxillary line in the 5th intercostal space

b)
One to the right of the upper sternum below the clavicle and one in the left midaxillary line in the 3rd intercostal space

c) ✔
One to the right of the upper sternum below the clavicle and one in the left midaxillary line in the 5th intercostal space

d)
One to the left of the upper sternum below the clavicle and one in the left midaxillary line in the 3rd intercostal space

e) One to the right of the lower sternum and one in the left midaxillary line in the 4th intercostal space

Answer

The pads should be positioned one to the right of the upper sternum below the clavicle and the other in the left midaxillary line in the 5th intercostal space.

Notes

Basic life support

- For chest compressions in adult basic life support the heel of one hand should be placed over the middle of the lower half of the patient's sternum with the other hand on top.
- The sternum should be depressed to a depth of 5 – 6 cm.
- Chest compressions should be performed at a rate of 100 – 120 per minute.
- Thirty compressions should be given before two breaths and that ratio continued (30:2).
- The person giving CPR should be changed every 2 minutes if possible to avoid exhaustion and poor quality chest compressions.
- Interruptions should be minimised (pauses should be < 5 seconds).

Advanced life support

- In adult advanced life support, basic life support should continue whilst the defibrillator pads are attached and the airway managed.
- The pads should be positioned one to the right of the upper sternum below the clavicle and the other in the left midaxillary line in the 5th intercostal space.
- Chest compressions should be paused briefly (< 5 secs) to assess the rhythm and then continued as the defibrillator charges if a shockable rhythm is identified or continued for a further two whole minutes if a non-shockable rhythm is identified.
- When delivering a shock, everybody should be clear of the patient (and any GTN patches and oxygen sources removed).
- Once the shock has been delivered, compressions should resume immediately and continue for a further two minutes before checking the rhythm again or feeling for a pulse.

Shockable rhythm (ventricular fibrillation or pulseless ventricular tachycardia)

- IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter.
- IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Non-shockable rhythm (asystole or pulseless electrical activity)

- IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 89 of 121

What is the mechanism of action of atropine in the management of bradyarrhythmias:

a Increases cAMP

b Nicotinic receptor agonist

c Muscarinic receptor antagonist

d Alpha-adrenergic agonist

e Beta-adrenergic agonist

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 89 of 121

What is the mechanism of action of atropine in the management of bradyarrhythmias:

a) Increases cAMP
b) Nicotinic receptor agonist
c) **Muscarinic receptor antagonist** ✔
d) Alpha-adrenergic agonist
e) Beta-adrenergic agonist

Answer

Atropine antagonises the action of the parasympathetic neurotransmitter acetylcholine at muscarinic receptors. Therefore it blocks the effect of the vagus nerve on both the sinoatrial and atrioventricular node, increasing sinus automaticity and facilitating AV node conduction.

Notes

Atropine is used in sinus, atrial or nodal bradycardia or AV block, when the haemodynamic condition of the patient is unstable because of the bradycardia. The dose in this case is 500 micrograms intravenously, repeated if necessary to a maximum of 3 mg. Doses greater than 3 mg can cause a paradoxical slowing of the heart rate.

Asystole during cardiac arrest is usually caused by primary myocardial pathology rather than excessive vagal tone and there is no evidence that routine use of atropine is beneficial in the treatment of asystole or PEA.

Mechanism of action

Atropine antagonises the action of the parasympathetic neurotransmitter acetylcholine at muscarinic receptors. Therefore it blocks the effect of the vagus nerve on both the sinoatrial and atrioventricular node, increasing sinus automaticity and facilitating AV node conduction.

Contraindications

Antimuscarinics should be avoided in:

- Gastrointestinal obstruction, intestinal atony or paralytic ileus
- Myasthenia gravis
- Prostatic enlargement, significant bladder outflow obstruction or urinary retention
- Severe ulcerative colitis or toxic megacolon

Adverse effects

Side effects of atropine are dose-related and include:

- Dilation of pupils with loss of accommodation
- Blurred vision
- Dry mouth
- Urinary retention
- Constipation
- Drowsiness
- Acute confusion
- Skin dryness and flushing
- Tachycardia, palpitations and arrhythmias

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 90 of 121

Adenosine is primarily indicated for which of the following:

a Non-shockable rhythm in cardiac arrest

b Ventricular tachycardia

c New onset fast atrial fibrillation

d Paroxysmal supraventricular tachycardia

e Bradyarrhythmias

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 90 of 121

Adenosine is primarily indicated for which of the following:

a) Non-shockable rhythm in cardiac arrest
b) Ventricular tachycardia
c) New onset fast atrial fibrillation
d) **Paroxysmal supraventricular tachycardia** ✔
e) Bradyarrhythmias

Answer

Adenosine is usually the treatment of choice for terminating paroxysmal supraventricular tachycardia including those associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome.

Notes

Adenosine is usually the treatment of choice for terminating paroxysmal supraventricular tachycardia including those associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome.

Mechanism of action

Adenosine stimulates A1-adenosine receptors and opens acetylcholine sensitive K+ channels, increasing K+ efflux. This hyperpolarises the cell membrane in the atrioventricular node and, by inhibiting the calcium channels, slows conduction in the AVN. As it has a very short duration of action (half-life only about 8 – 10 seconds), most side effects are short lived.

Administration

For a regular narrow-complex tachycardia the first step is to attempt vagal manoeuvres. If this is unsuccessful and the tachyarrhythmia persists, 6 mg intravenous adenosine should be administered into a central/large vein over 2 seconds, followed by 12 mg after 1 – 2 minutes if required, then a further 12 mg after 1 – 2 minutes if required (max 30 mg).

The effects of adenosine are potentiated by dipyridamole, therefore if it is essential to give adenosine in a patient taking dipyridamole the dose should be quartered.

The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection. If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.

Contraindications

Adenosine is contraindicated in:

- Asthma and COPD (can cause bronchospasm)
- Decompensated heart failure
- Long QT syndrome
- Second- or third-degree AV block and sick sinus syndrome (unless pacemaker fitted)
- Severe hypotension

Adverse effects

Common side effects of adenosine include:

- Apprehension
- Dizziness, flushing, headache, nausea, dyspnoea
- Angina (discontinue)
- AV block, sinus pause and arrhythmia (discontinue if asystole or severe bradycardia occur)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 91 of 121

Sodium nitroprusside is used therapeutically for which of the following effects:

a Alpha-blockade

b Vasodilation

c Negative inotropic effect

d Negative chronotropic effect

e Bronchodilation

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 91 of 121

Sodium nitroprusside is used therapeutically for which of the following effects:

a) Alpha-blockade
b) **Vasodilation** ✔
c) Negative inotropic effect
d) Negative chronotropic effect
e) Bronchodilation

Answer

Sodium nitroprusside decomposes in the blood to release nitric oxide, an unstable compound that causes vasodilation. Sodium nitroprusside may be used to lower blood pressure in hypertensive emergencies or to relieve symptoms in congestive cardiac failure.

Notes

Sodium nitroprusside decomposes in the blood to release nitric oxide, an unstable compound that causes vasodilation.

Indications

Sodium nitroprusside is indicated for

- Hypertensive emergencies
- Controlled hypotension in anaesthesia during surgery
- Acute or chronic heart failure

Contraindications

It is contraindicated in

- Compensatory hypertension
- Leber's optic atrophy
- Severe vitamin B12 deficiency

Cautions

It is should be used with caution in

- Elderly
- Hyponatraemia
- Hypothermia
- Hypothyroidism
- Impaired cerebral circulation
- Ischaemic heart disease

Adverse effects

Side effects associated with over rapid reduction in blood pressure include: headache, dizziness, nausea, retching, abdominal pain, perspiration, palpitation, anxiety, retrosternal discomfort; the infusion rate should be reduced if any of these side effects occur.

Side effects caused by excessive plasma concentration of the cyanide metabolite include tachycardia, sweating, hyperventilation, arrhythmias, marked metabolic acidosis; the drug should be discontinued and the cyanide antidote given if these effects occur.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 92 of 121

Which of the following is NOT a benefit of low molecular weight heparin (LMWH) compared to unfractionated heparin:

a Longer plasma half-life

b Lower risk of thrombocytopaenia

c Lower risk of osteoporosis

d Readily reversed with specific antidote

e More predictable dose-response

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 92 of 121

Which of the following is NOT a benefit of low molecular weight heparin (LMWH) compared to unfractionated heparin:

a) **Longer plasma half-life** ✗
b) Lower risk of thrombocytopaenia
c) Lower risk of osteoporosis
d) Readily reversed with specific antidote ✓
e) More predictable dose-response

Answer

Unfractionated is more readily reversible as it has a shorter duration of action. If haemorrhage occurs it is usually sufficient to withdraw unfractionated or low molecular weight heparin, but if rapid reversal of the effects of the heparin is required, protamine sulfate is a specific antidote (but only partially reverses the effects of low molecular weight heparins).

Advantages of LMWH
Greater ability to inhibit factor Xa directly, interacting less with platelets and so may have a lesser tendency to cause bleeding
Greater bioavailability and longer half-life in plasma making once daily subcutaneous administration possible
More predictable dose response avoiding the need for routine anticoagulant monitoring
Lower associated risk of heparin-induced thrombocytopenia or of osteoporosis

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Heparin potentiates the activity of antithrombin III, causing inactivation of thrombin. The heparin-antithrombin III complex also inhibits factor Xa and some other factors. Low molecular weight heparin (LMWH) preparations inhibit only factor Xa. PT and APTT may both be prolonged but the PT less so.

Contraindications

Heparins are contraindicated:

- In people with current (or history of) heparin-induced thrombocytopenia
- In people with acute bacterial endocarditis
- In people with active major bleeding, and conditions with a high risk of uncontrolled bleeding, including recent haemorrhagic stroke, major trauma, recent brain, spinal cord or eye surgery, haemophilia and thrombocytopenia
- In people with active gastric or duodenal ulceration

Adverse effects

- Bleeding
- Heparin-induced thrombocytopenia (immune-mediated effect that usually develops after 5 – 10 days, signs may include a 30% reduction of platelet count, thrombosis, or skin allergy; if HIT is suspected or confirmed, heparin should be discontinued and an alternative anticoagulant given)
- Hyperkalaemia (due to inhibition of aldosterone secretion; patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium or those taking potassium-sparing drugs seem to be more susceptible)
- Osteoporosis (risk lower with LMWH)
- Alopecia
- Hypersensitivity reactions
- Injection site reactions

Low molecular weight heparin vs unfractionated heparin

Unfractionated heparin is usually given by continuous intravenous infusion for the smoothest control and is the treatment of choice where rapid reversal of anticoagulation may be required (e.g. in surgical patients or late pregnancy). Therapy is monitored by maintaining the APTT at 1.5 – 2.5 times the upper limit of normal.

Low molecular weight heparin (LMWH) preparations have largely replaced unfractionated heparin.

Advantages of LMWH
Greater ability to inhibit factor Xa directly, interacting less with platelets and so may have a lesser tendency to cause bleeding
Greater bioavailability and longer half-life in plasma making once daily subcutaneous administration possible
More predictable dose response avoiding the need for routine anticoagulant monitoring
Lower associated risk of heparin-induced thrombocytopenia or of osteoporosis

Haemorrhage

Because it has a short duration of action, if haemorrhage occurs it is usually sufficient to withdraw unfractionated or low molecular weight heparin, but if rapid reversal of the effects of the heparin is required, protamine sulfate is a specific antidote (but only partially reverses the effects of low molecular weight heparins).

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 93 of 121

Which of the following is NOT an adverse effect associated with warfarin therapy:

a Hepatic dysfunction

b Calciphylaxis

c Skin necrosis

d Pancreatitis

e Renal impairment

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 93 of 121

Which of the following is NOT an adverse effect associated with warfarin therapy:

a) Hepatic dysfunction
b) Calciphylaxis
c) Skin necrosis
d) **Pancreatitis** ✗
e) Renal impairment ✓

Answer

Adverse effects of warfarin:

- The most common adverse effect of warfarin is bleeding
- Other common adverse effects of warfarin include nausea, vomiting, diarrhoea, jaundice, hepatic dysfunction, pancreatitis, pyrexia, alopecia, purpura, and rash
- Skin necrosis is a rare but serious adverse effect of warfarin; treatment with warfarin should be stopped if warfarin related skin necrosis is suspected
- Calciphylaxis is a rare, but a very serious condition that causes vascular calcification and cutaneous necrosis

Notes

The main use of anticoagulants is to prevent thrombus formation or extension of an existing thrombus in the slower-moving venous side of the circulation, where the thrombus consists of a fibrin web enmeshed with platelets and red cells. Anticoagulants are of less use in preventing thrombus formation in arteries, for in faster-flowing vessels thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Warfarin is a vitamin K antagonist and will reduce the activity of vitamin-K dependent clotting factors (factors VII, IX, X and II) and of protein C and S.

Both the PT and APTT are usually prolonged but the PT is grossly prolonged and the APTT only mildly.

Indications

Warfarin is licensed for:

- Prophylaxis of systemic embolism in people with rheumatic heart disease and atrial fibrillation
- Prophylaxis after insertion of prosthetic heart valves
- Prophylaxis and treatment of venous thrombosis and pulmonary embolism
- Transient attacks of cerebral ischaemia

Warfarin takes at least 48 to 72 hours for the anticoagulant effect to develop and if an immediate effect is required, heparin must be given concomitantly and continued for at least 5 days and until the INR is greater or equal to 2.0 for more than 24 hours. The duration of treatment is dependent on the indication.

Contraindications

- Haemorrhagic stroke
- Clinically significant bleeding
- Within 72 hours of major surgery with risk of severe bleeding
- Within 48 hours postpartum
- Pregnancy
- Untreated bleeding disorders for example, thrombocytopenia, haemophilia, liver failure and renal failure
- Potential bleeding lesions for example; active peptic ulcer; oesophageal varices; aneurysm; proliferative retinopathy; recent organ biopsy; recent trauma or surgery to head, orbit, or spine; recent stroke; confirmed intracranial or intraspinal bleed

Cautions

Warfarin should be used with caution in any patient at increased risk of haemorrhage with risk factors including:

- People aged over 65 years
- Previous bleeding episode, history of gastrointestinal bleeding or anaemia
- Recent ischaemic stroke, hypertension, heart disease, cerebrovascular disease, renal disease, liver disease, active peptic ulcer
- Recent or imminent surgery or trauma
- Excessive alcohol intake, frequent or significant falls
- Regular use of NSAIDs or other drugs that increase risk of bleeding

Adverse effects

- The most common adverse effect of warfarin is bleeding
- Other common adverse effects of warfarin include nausea, vomiting, diarrhoea, jaundice, hepatic dysfunction, pancreatitis, pyrexia, alopecia, purpura, and rash
- Skin necrosis is a rare but serious adverse effect of warfarin; treatment with warfarin should be stopped if warfarin related skin necrosis is suspected
- Calciphylaxis is a rare, but a very serious condition that causes vascular calcification and cutaneous necrosis

Monitoring

The prothrombin time, reported as the INR is used to monitor warfarin therapy; the target INR is dependent on the indication.

Warfarin may need to be omitted for a couple of doses if the INR rises above the target range or even reversed if the INR is > 8.0 or there are signs of bleeding. Phytomenadione (vitamin K) can be given as a specific antidote to warfarin or in cases of major bleeding, dried prothrombin complex (factors II, VII, IX, and X); if dried prothrombin complex is unavailable, fresh frozen plasma can be given but is less effective.

Scenario	Management
INR 5.0 – 8.0, no bleeding	Withhold 1 – 2 doses of warfarin and reduce subsequent maintenance dose
INR 5.0 – 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, restart warfarin when INR < 5.0
INR > 8.0, no bleeding	Stop warfarin, give phytomenadione orally, restart warfarin when INR < 5.0
INR > 8.0, minor bleeding	Stop warfarin, give phytomenadione intravenously, repeat dose if INR still too high after 24 h, restart warfarin when INR < 5.0
Major bleeding	Stop warfarin, give phytomenadione intravenously, give dried prothrombin complex

Drug interactions

Increased anticoagulant effect	Decreased anticoagulant effect
Alcohol	Tricyclic antidepressants
Amiodarone	St John's wort
Antibiotics(co-trimoxazole, metronidazole, quinolones, macrolides)	Vitamin K-containing vitamin complexes, some enteral feeds, mineral supplements, and green vegetables
Antidepressants (SSRIs, SNRIs, TCAs)	Rifampicin
Azoles	Carbamazepine
Cranberry juice	Phenobarbital
Corticosteroids	Primidone
Fibrates	Azathioprine
NSAIDs	Phenytoin
Thyroxine	Griseofulvin

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 94 of 121

Adenosine has a half-life of approximately:

a 8 – 10 seconds

b 8 – 10 minutes

c 30 minutes

d 1 hour

e 6 – 8 hours

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 94 of 121

Adenosine has a half-life of approximately:

a) 8 – 10 seconds ✔
b) 8 – 10 minutes
c) **30 minutes** ✖
d) 1 hour
e) 6 – 8 hours

Answer

Adenosine stimulates A1-adenosine receptors and opens acetylcholine sensitive K+ channels, increasing K+ efflux. This hyperpolarises the cell membrane in the atrioventricular node and, by inhibiting the calcium channels, slows conduction in the AVN. As it has a very short duration of action (half-life only about 8 – 10 seconds), most side effects are short lived.

Notes

Adenosine is usually the treatment of choice for terminating paroxysmal supraventricular tachycardia including those associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome.

Mechanism of action

Adenosine stimulates A1-adenosine receptors and opens acetylcholine sensitive K+ channels, increasing K+ efflux. This hyperpolarises the cell membrane in the atrioventricular node and, by inhibiting the calcium channels, slows conduction in the AVN. As it has a very short duration of action (half-life only about 8 – 10 seconds), most side effects are short lived.

Administration

For a regular narrow-complex tachycardia the first step is to attempt vagal manoeuvres. If this is unsuccessful and the tachyarrhythmia persists, 6 mg intravenous adenosine should be administered into a central/large vein over 2 seconds, followed by 12 mg after 1 – 2 minutes if required, then a further 12 mg after 1 – 2 minutes if required (max 30 mg).

The effects of adenosine are potentiated by dipyridamole, therefore if it is essential to give adenosine in a patient taking dipyridamole the dose should be quartered.

The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection. If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.

Contraindications

Adenosine is contraindicated in:

- Asthma and COPD (can cause bronchospasm)
- Decompensated heart failure
- Long QT syndrome
- Second- or third-degree AV block and sick sinus syndrome (unless pacemaker fitted)
- Severe hypotension

Adverse effects

Common side effects of adenosine include:

- Apprehension
- Dizziness, flushing, headache, nausea, dyspnoea
- Angina (discontinue)
- AV block, sinus pause and arrhythmia (discontinue if asystole or severe bradycardia occur)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 95 of 121

All of the following are indications for beta-blockers EXCEPT for:

a Prinzmetal's angina

b Thyrotoxicosis

c Heart failure

d Atrial fibrillation

e Essential tremor

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 95 of 121

All of the following are indications for beta-blockers EXCEPT for:

a) Prinzmetal's angina ✔
b) Thyrotoxicosis
c) Heart failure
d) Atrial fibrillation
e) Essential tremor

Answer

Beta-blockers are contraindicated in Prinzmetal's angina.

Beta-blockers may be indicated in:

- Hypertension
- Pheochromocytoma (only with an alpha-blocker)
- Angina
- Secondary prevention after ACS
- Arrhythmias including atrial fibrillation
- Heart failure
- Thyrotoxicosis
- Anxiety
- Prophylaxis of migraine
- Essential tremor
- Glaucoma

Notes

Beta-blockers block the beta-adrenoceptors in the heart, peripheral vasculature, bronchi, pancreas and liver.

Therapeutic effects

- Cardiovascular system
  - Reduce blood pressure
  - Reduce heart rate, contractility and cardiac output
  - Increase AV conduction time, refractoriness and suppress automaticity
- Eye
  - Reduce intraocular pressure
- Respiratory system
  - Cause bronchoconstriction

Type examples

Many beta-blockers are now available and in general they are all equally effective. There are, however, differences between them, which may affect choice in treating particular diseases or individual patients.

Sotalol hydrochloride, a non-cardioselective beta-blocker with additional class III antiarrhythmic activity, is used for prophylaxis in paroxysmal supraventricular arrhythmias. It also suppresses ventricular ectopic beats and nonsustained ventricular tachycardia. It has been shown to be more effective than lidocaine in the termination of spontaneous sustained ventricular tachycardia due to coronary disease or cardiomyopathy. However, it may prolong the QT-interval and induce torsade de pointes in susceptible patients.

Labetalol has, in addition to other beta-blocker effects, an arteriolar vasodilating action by diverse mechanisms, and thus lowers peripheral resistance. Labetalol is useful for treating hypertensive emergencies and in the treatment of hypertension of pheochromocytoma.

Esmolol hydrochloride is a relatively cardioselective beta-blocker with a very short duration of action, used intravenously for the short-term treatment of supraventricular arrhythmias, sinus tachycardia, or hypertension, particularly in the perioperative period.

Indications

Beta-blockers may be indicated in:

- Hypertension
- Pheochromocytoma (only with an alpha-blocker)
- Angina
- Secondary prevention after ACS
- Arrhythmias including atrial fibrillation
- Heart failure
- Thyrotoxicosis
- Anxiety
- Prophylaxis of migraine
- Essential tremor
- Glaucoma

Contraindications

Beta-blockers are contraindicated in people with:

- A history of asthma or bronchospasm.
- Reversible or severe COPD
- Known intolerance or hypersensitivity to beta-blockers
- Severe or symptomatic bradycardia (heart rate less than 60 beats per minute)
- Sinoatrial block, second- or third-degree heart block (unless there is a pacemaker in place)
- Severe or uncontrolled heart failure
- Severe or symptomatic hypotension (systolic blood pressure less than 90 mmHg)
- Severe peripheral arterial disease (including intermittent claudication) or Raynaud's syndrome
- Sick sinus syndrome
- Cardiogenic shock or phaeochromocytoma (without a concomitant alpha-blocker)
- Frequent episodes of hypoglycaemia

Cautions

Beta-blockers should be used with caution in people with:

- Heart failure with chronic kidney disease (CKD), hypotension, ischaemic heart disease, or less severe peripheral arterial disease
- Prinzmetal's angina
- Current or recent (within 4 weeks) exacerbation of heart failure
- First-degree atrioventricular heart block
- Portal hypertension (risk of deterioration in liver function)
- Diabetes mellitus (affects carbohydrate metabolism and symptoms of hypoglycaemia may be masked)
- COPD
- Myasthenia gravis
- Psoriasis
- Thyrotoxicosis (symptoms may be masked)
- People who wear contact lenses (reduced secretion of lacrimal fluid)
- Chronic kidney disease

Adverse effects

- Deteriorating symptoms of heart failure (such as symptoms of fluid overload and fatigue)
- Hypotension and bradycardia
- Dizziness, headache, and syncope
- Nausea, vomiting, diarrhoea, and constipation
- Sexual dysfunction including erectile dysfunction and loss of libido
- Cold extremities, paraesthesia, and numbness (more common in people with peripheral arterial disease)
- Effect on carbohydrate metabolism (hypo- or hyperglycaemia in people with or without diabetes mellitus)
- Effect on metabolic and autonomic response to hypoglycaemia (possible masking of hypoglycaemia warning signs such as tremor and tachycardia)
- Fatigue and asthenia (lack of energy and strength)
- Sleep disturbance, nightmares, and depression
- Bronchospasm
- Reduction of secretion of lacrimal fluid (may affect people who wear contact lenses)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 96 of 121

Clinical features of digoxin toxicity include all of the following EXCEPT for:

a Visual disturbance

b Gastrointestinal disturbance

c Hyperkalaemia

d Hypoglycaemia

e Arrhythmias

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 96 of 121

Clinical features of digoxin toxicity include all of the following EXCEPT for:

a) Visual disturbance
b) Gastrointestinal disturbance
c) **Hyperkalaemia** ✗
d) Hypoglycaemia ✓
e) Arrhythmias

Answer

Digoxin has a narrow therapeutic index. Features of toxicity include gastrointestinal effects (nausea, vomiting, anorexia and diarrhea), visual disturbance (blurred or yellow vision), CNS effects (weakness, dizziness, confusion, headache, malaise, psychosis), hyperkalaemia, and conduction disorders and arrhythmias. Hypoglycaemia is not a typical adverse effect of digoxin toxicity.

Notes

Digoxin is a cardiac glycoside that increases the force of myocardial contraction (positive inotrope), and slows the heart rate (negative chronotrope). Digoxin has a narrow therapeutic index; digoxin toxicity can occur even when the serum digoxin concentration is within the therapeutic range (between 0.7 – 2.0 mcg/L).

Mechanism of action

Inotropic effect:

Digoxin inhibits membrane Na+/K+ ATPase, which is responsible for Na+/K+ exchange across the myocyte cell membrane. This increases intracellular Na+ and produces a secondary increase in intracellular Ca2+ that increases the force of myocardial contraction. The increase in intracellular Ca2+ occurs because the decreased Na+ gradient across the membrane reduces the extrusion of Ca2+ by the Na+/Ca2+ exchanger that normally occurs during diastole. Digoxin and K+ ions compete for the receptor on the outside of the muscle cell membrane, and so the effects of digoxin may be dangerously increased in hypokalaemia.

Chronotropic effect:

Digoxin stimulates vagal activity , causing the release of ACh, which slows the heart rate, slows atrioventricular conduction and prolongs the refractory period in the AVN and bundle of His. By delaying AV conduction, digoxin increases the degree of block, and slows and strengthens the ventricular beat.

Indications

Digoxin is most useful for controlling the ventricular response in persistent and permanent atrial fibrillation and atrial flutter. Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation. It is now rarely used for rapid control of heart rate, as even with intravenous administration, response may take many hours.

Digoxin also has a role in the management of heart failure; digoxin improves symptoms of heart failure and exercise tolerance and reduces hospitalisation due to acute exacerbations but it does not reduce mortality. Digoxin is reserved for patients with worsening or severe heart failure due to left ventricular systolic dysfunction refractory to combination therapy with first-line agents.

Contraindications

Digoxin is contraindicated in:

- Supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome
- Ventricular tachycardia or fibrillation
- Heart conduction problems e.g. second degree or intermittent complete heart block
- Hypertrophic cardiomyopathy (unless concomitant atrial fibrillation and heart failure but should be used with caution)

Cautions

Digoxin should be used with caution in:

- Hypercalcaemia (risk of digitalis toxicity)
- Hypokalaemia (risk of digitalis toxicity; diuretics may predispose to hypokalaemia)
- Hypomagnesaemia (risk of digitalis toxicity)
- Hypoxia (risk of digitalis toxicity)
- Recent myocardial infarction
- Severe respiratory disease
- Sick sinus syndrome
- Thyroid disease
- Constrictive pericarditis
- Renal impairment (reduce dose and monitor plasma-digoxin concentration; toxicity increased by electrolyte disturbances)
- Elderly people (reduce dose)
- Concomitant drug therapy with drugs which may increase plasma concentration of digoxin e.g. amiodarone, antimicrobials, calcium-channel blockers, spironolactone

Adverse effects

The adverse effects of digoxin are frequently due to its narrow therapeutic window and include:

- Cardiac adverse effects
  - Sinoatrial and atrioventricular block
  - Premature ventricular contractions
  - PR prolongation and ST-segment depression
- Nausea, vomiting and diarrhoea
- Blurred or yellow vision
- CNS effects
  - weakness, dizziness, confusion, apathy, malaise, headache, depression, psychosis
- Thrombocytopenia and agranulocytosis (rare)
- Gynaecomastia in men in prolonged administration

Digoxin toxicity

Unwanted effects of digoxin depend on both the plasma concentration of digoxin (increasing risk of toxicity through the range 1.5 – 3 mcg/L) and on the sensitivity of the conducting system or of the myocardium, which is often increased in heart disease. Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Care should also be taken in the elderly who are particularly susceptible to digoxin toxicity.

If toxicity occurs, digoxin should be withdrawn. Digoxin-specific antibody fragments are indicated for the treatment of known or strongly suspected life-threatening digoxin toxicity associated with ventricular arrhythmias or bradyarrhythmias unresponsive to atropine sulfate and when measures beyond the withdrawal of digoxin and correction of any electrolyte abnormalities are considered necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 97 of 121

What is the maximum dose of adenosine recommended for management of a regular narrow-complex tachycardia:

a 6 mg

b 12 mg

c 24 mg

d 30 mg

e 36 mg

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 97 of 121

What is the maximum dose of adenosine recommended for management of a regular narrow-complex tachycardia:

a) 6 mg
b) 12 mg
c) 24 mg
d) **30 mg** ✔
e) 36 mg

Answer

The first step in treatment of regular narrow-complex tachycardias is to attempt vagal manoeuvres (carotid sinus massage or Valsalva manoeuvre). If the tachyarrhythmia persists, adenosine 6 mg IV should be given as a rapid bolus using a large cannula and a large vein. If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg).

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 98 of 121

Regarding ACE inhibitors, which of the following statements is CORRECT:

a They are contraindicated in diabetic nephropathy due to risk of worsening renal impairment.

b They are recommended first line treatment for hypertension in patients of Afro-Caribbean descent.

c ACE inhibitors are used first line for hypertension in pregnancy.

d Angiotensin-II receptor blockers are a useful alternative in patients who cannot tolerate ACE-inhibitors due a persistent cough.

e ACE-inhibitors cause a increase in histamine release which can result in a persistent dry cough.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 98 of 121

Regarding ACE inhibitors, which of the following statements is CORRECT:

a) ✖
They are contraindicated in diabetic nephropathy due to risk of worsening renal impairment.

b) They are recommended first line treatment for hypertension in patients of Afro-Caribbean descent.

c) ACE inhibitors are used first line for hypertension in pregnancy.

d) ✔
Angiotensin-II receptor blockers are a useful alternative in patients who cannot tolerate ACE-inhibitors due a persistent cough.

e) ACE-inhibitors cause a increase in histamine release which can result in a persistent dry cough.

Answer

ACE inhibitors should be used with caution in patients of Afro-Caribbean descent who may respond less well; calcium channel blockers are first line for hypertension in these patients. ACE inhibitors have a role in the management of diabetic nephropathy. ACE inhibitors are contraindicated in pregnant women. ACE inhibitors inhibit the breakdown of bradykinin; this is the cause of the persistent dry cough. Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 99 of 121

Which of the following is NOT a typical side effect of glyceryl trinitrate:

a Flushing

b Tachycardia

c Hyperkalaemia

d Postural hypotension

e Throbbing headache

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 99 of 121

Which of the following is NOT a typical side effect of glyceryl trinitrate:

a) Flushing
b) Tachycardia
c) **Hyperkalaemia** ✔
d) Postural hypotension
e) Throbbing headache

Answer

Side effects such as dizziness, flushing, tachycardia, throbbing headache and postural hypotension may limit therapy, especially when angina is severe or when patients are unusually sensitive to the effects of nitrates. Prolonged high dosage may cause methaemoglobinaemia as a result of oxidation of haemoglobin.

Notes

Nitrates are useful in the management of angina. Although they are potent coronary vasodilators, the main benefit derives from a reduction in venous return which in turn reduces left ventricular effort, decreasing oxygen demands and relieving anginal pain.

Vasodilators can also act in heart failure by arteriolar dilatation which reduces both peripheral vascular resistance and left ventricular pressure during systole resulting in improved cardiac output. They can also cause venous dilatation which results in dilatation of capacitance vessels, increase of venous pooling, and diminution of venous return to the heart (decreasing left ventricular end-diastolic pressure).

Mechanism of action

Initial metabolism of these drugs releases nitrite ions, which undergoes intracellular conversion to nitric oxide (NO). Nitric oxide then activates guanylyl cyclase, causing an increase in the intracellular concentration of cGMP in the vascular smooth muscle cells. cGMP activates protein kinase G, an enzyme that ultimately causes vascular smooth muscle relaxation.

Type examples

Sublingual glyceryl trinitrate (GTN) is one of the most effective drugs for providing rapid relief of angina, although its effects only last for 20 – 30 minutes. It may be administered as sublingual tablets or by sublingual administration using aerosol spray.

If sublingual glyceryl trinitrate is required more than twice a week, then combined therapy is required, where beta-blockers or calcium-channel blockers are taken in addition to nitrates which are reserved for acute attacks. If necessary, a long-acting nitrate is added.

Long-acting nitrates are more stable and may be effective for several hours, depending on the drug and the preparation (sublingual, oral, modified release). Isosorbide dinitrate is widely used; duration of action of up to 12 hours is claimed for modified-release preparations. The use of isosorbide mononitrate, which is the main active metabolite of the dinitrate, avoids the variable absorption and unpredictable first-pass metabolism of the dinitrate.

Glyceryl trinitrate or isosorbide dinitrate may be tried by intravenous injection when the sublingual form is ineffective in patients with chest pain due to myocardial infarction or severe ischaemia. Intravenous injections are also useful in the treatment of congestive heart failure.

Adverse effects

Side effects such as dizziness, flushing, tachycardia, throbbing headache and postural hypotension may limit therapy, especially when angina is severe or when patients are unusually sensitive to the effects of nitrates. Prolonged high dosage may cause methaemoglobinaemia as a result of oxidation of haemoglobin.

Contraindications

Nitrates should not be used in people with:

- Acute myocardial infarction (MI) with low filling pressure, acute circulatory failure, (shock, vascular collapse), or very low blood pressure
- Hypertrophic obstructive cardiomyopathy (HOCM), constrictive pericarditis, cardiac tamponade, low cardiac filling pressures, or aortic/mitral valve stenosis
- Diseases associated with a raised intracranial pressure (for example following a head trauma, including cerebral haemorrhage)
- Severe anaemia
- Closed angle glaucoma
- Severe hypotension, or hypovolaemia

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 100 of 121

Your consultant wishes to chemically cardiovert a patient who has presented to ED with new onset atrial fibrillation (AF). Which of the following would be an absolute contraindication to the use of flecainide:

a Asthma

b Thyroid dysfunction

c Acute porphyrias

d Heart failure

e Hypokalaemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 100 of 121

Your consultant wishes to chemically cardiovert a patient who has presented to ED with new onset atrial fibrillation (AF). Which of the following would be an absolute contraindication to the use of flecainide:

a) Asthma
b) Thyroid dysfunction
c) Acute porphyrias
d) **Heart failure** ✔
e) Hypokalaemia

Answer

Sinus rhythm can be restored by electrical cardioversion, or pharmacological cardioversion with an oral or intravenous antiarrhythmic drug e.g. flecainide or amiodarone. Flecainide should not be given when there is known ischaemic or structural heart disease. Consider amiodarone in patients with left ventricular impairment or heart failure.

Notes

Flecainide acetate is an orally active class Ic antiarrhythmic and may be of value for serious symptomatic ventricular arrhythmias. It may also be indicated for junctional re-entry tachycardias and for paroxysmal atrial fibrillation. However, it has a negative inotropic action and can precipitate serious arrhythmias in a small minority of patients (including those with otherwise normal hearts).

Contraindications

Flecainide is contraindicated in:

- Abnormal left ventricular function
- Atrial conduction defects (unless pacing rescue available)
- Bundle branch block (unless pacing rescue available)
- Distal block (unless pacing rescue available)
- Haemodynamically significant valvular heart disease
- Heart failure
- History of myocardial infarction and either asymptomatic ventricular ectopics or asymptomatic non-sustained ventricular tachycardia
- Long-standing atrial fibrillation where conversion to sinus rhythm not attempted
- Second-degree or greater AV block (unless pacing rescue available)
- Sinus node dysfunction (unless pacing rescue available)

Cautions

Flecainide should be used with caution in:

- Atrial fibrillation following heart surgery
- Elderly (accumulation may occur)
- Patients with pacemakers (especially those who may be pacemaker dependent because stimulation threshold may rise appreciably)

Adverse effects

Common side effects of flecainide include:

- Asthenia
- Dizziness
- Dyspnoea
- Fatigue
- Fever
- Oedema
- Pro-arrhythmic effects
- Visual disturbances

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 101 of 121

What is the initial dose of amiodarone recommended for treatment of a stable regular broad-complex tachycardia:

a 50 mg

b 150 mg

c 200 mg

d 300 mg

e 400 mg

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 101 of 121

What is the initial dose of amiodarone recommended for treatment of a stable regular broad-complex tachycardia:

a) 50 mg
b) 150 mg
c) 200 mg
d) **300 mg** ✔
e) 400 mg

Answer

A ventricular tachycardia (or broad-complex tachycardia of uncertain origin) should be treated with amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours.

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 102 of 121

A 49 year old man is brought to ED complaining of palpitations and dyspnoea. ECG demonstrates Torsade de Pointes. Which of the following should be given immediately to this patient:

a Adenosine 6 mg IV

b Magnesium sulfate 2 g IV

c Amiodarone 300 mg IV

d Verapamil 5 mg IV

e Atropine 500 mcg IV

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 102 of 121

A 49 year old man is brought to ED complaining of palpitations and dyspnoea. ECG demonstrates Torsade de Pointes. Which of the following should be given immediately to this patient:

a) Adenosine 6 mg IV
b) **Magnesium sulfate 2 g IV** ✔
c) Amiodarone 300 mg IV
d) Verapamil 5 mg IV
e) Atropine 500 mcg IV

Answer

Torsade de pointes is a form of ventricular tachycardia associated with a long QT syndrome (usually drug-induced, but other factors including hypokalaemia, severe bradycardia, and genetic predisposition are also implicated). Episodes are usually self-limiting, but are frequently recurrent and can cause impairment or loss of consciousness. If not controlled, the arrhythmia can progress to ventricular fibrillation and sometimes death. Intravenous infusion of magnesium sulfate (2 g IV over 10 minutes) is usually effective. A beta-blocker (but not sotalol hydrochloride) and atrial (or ventricular) pacing can be considered. Antiarrhythmics can further prolong the QT interval, thus worsening the condition.

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 103 of 121

Nimodipine is used predominantly for the treatment of:

a Termination of paroxysmal supraventricular tachycardia

b Refractory angina

c Prevention and treatment of vascular spasm following subarachnoid haemorrhage

d Hypertensive emergencies

e Termination of broad-complex tachycardia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 103 of 121

Nimodipine is used predominantly for the treatment of:

a) Termination of paroxysmal supraventricular tachycardia
b) Refractory angina
c) Prevention and treatment of vascular spasm following subarachnoid haemorrhage ✔
d) **Hypertensive emergencies** ✖
e) Termination of broad-complex tachycardia

Answer

Nimodipine is related to nifedipine but the smooth muscle relaxant effects preferentially act on cerebral arteries. It is used solely for the prevention and treatment of vascular spasm following aneurysmal subarachnoid haemorrhage.

Notes

Calcium channel blockers are widely used in the treatment of angina (second line to beta-blockers) and also for hypertension, heart failure and arrhythmias.

Calcium channel blockers vary widely in their predilection for the various possible sites of action and in their therapeutic effects and may be divided into the dihydropyridine type (e.g. amlodipine, nifedipine and nimodipine) and the rate-limiting non-dihydropyridine type (e.g. verapamil, diltiazem).

Mechanism of action

Calcium channel blockers inhibit L-type voltage-sensitive calcium channels in arterial smooth muscle, causing relaxation and vasodilation. They also block calcium channels within the myocardium and conducting tissues of the heart which produces a negative inotropic effect by reducing calcium influx during the plateau phase of the action potential.

The dihydropyridines have relatively little effect on the heart because they have a much higher affinity for inactivated channels found more frequently in vascular muscle. Furthermore, at clinical doses, vasodilation results in a reflex increase in sympathetic tone that counteracts the mild negative inotropic effect. The non-dihydropyridines are rate-limiting calcium-channel blockers that depress the sinus node and slow conduction in the atrioventricular node, causing a mild resting bradycardia.

Contraindications

Non-dihydropyridine CCBs:

- Atrial flutter or fibrillation
- Heart failure or history of heart failure (may precipitate or aggravate symptoms)
- Cardiac outflow obstruction e.g. significant aortic stenosis or obstructive hypertrophic cardiomyopathy (vasodilation may result in reduced cardiac output)
- Second or third degree AV block (may induce complete AV block)
- Severe bradycardia
- Sick sinus syndrome

Dihydropyridine CCBs:

- Uncontrolled heart failure
- Severe hypotension
- Cardiac outflow obstruction

Adverse effects

- Gastrointestinal adverse effects – constipation, nausea, dyspepsia
- Bradycardia, AV block, reflex tachycardia, palpitations
- Vasodilatory adverse effects – flushing, dizziness, headache, postural hypotension, ankle swelling (more common with dihydropyridine calcium-channel blockers and often improve with continued use, although ankle swelling often persists)
- Gingival hyperplasia
- Malaise and fatigue
- Myalgia and arthralgia

Verapamil

Verapamil is used for the treatment of angina, hypertension, and arrhythmias. Verapamil is highly negatively inotropic and reduces cardiac output, slows the heart rate and may impair atrioventricular conduction. It may precipitate heart failure, exacerbate conduction disorders, and cause hypotension at high doses and should not be used with beta-blockers. Constipation is the most common side effect.

Nifedipine

Nifedipine relaxes vascular smooth muscle and dilates coronary and peripheral arteries. Nifedipine has less myocardial effects than verapamil and has no antiarrhythmic properties but has more influence on the vessels. Unlike verapamil it rarely precipitates heart failure because any negative inotropic effect is offset by a reduction in left ventricular work.

Nimodipine

Nimodipine is related to nifedipine but the smooth muscle relaxant effects preferentially act on cerebral arteries. It is used solely for the prevention and treatment of vascular spasm following aneurysmal subarachnoid haemorrhage.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 104 of 121

A tachyarrhythmia is defined as broad-complex if the QRS duration is:

a Greater than 0.16 s

b Greater than or equal to 0.12 s

c Greater than 0.12 s

d Greater than 0.10 s

e Greater than 0.2 s

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 104 of 121

A tachyarrhythmia is defined as broad-complex if the QRS duration is:

a) Greater than 0.16 s
b) **Greater than or equal to 0.12 s** ✔
c) Greater than 0.12 s
d) Greater than 0.10 s
e) Greater than 0.2 s

Answer

If the patient with a tachyarrhythmia is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin)** should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 105 of 121

What is the mechanism of action of abciximab:

a Inhibition of platelet thromboxane A2 synthesis

b Inhibition of binding of ADP to its platelet receptor

c Blocking the binding of fibrinogen to GPIIb/IIIa receptor sites

d Inhibition of the breakdown of cAMP

e Inhibition of thrombin-induced platelet aggregation

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 105 of 121

What is the mechanism of action of abciximab:

a) Inhibition of platelet thromboxane A2 synthesis
b) Inhibition of binding of ADP to its platelet receptor
c) **Blocking the binding of fibrinogen to GPIIb/IIIa receptor sites** ✔
d) Inhibition of the breakdown of cAMP
e) Inhibition of thrombin-induced platelet aggregation

Answer

Glycoprotein IIb/IIIa inhibitors prevent platelet aggregation by blocking the binding of fibrinogen to receptors on platelets.

Notes

Glycoprotein IIb/IIIa inhibitors prevent platelet aggregation by blocking the binding of fibrinogen to receptors on platelets.

Abciximab is a monoclonal antibody which binds to glycoprotein IIb/IIIa receptors and to other related sites; it is licensed as an adjunct to unfractionated heparin and aspirin for the prevention of ischaemic complications in high-risk patients undergoing percutaneous transluminal coronary intervention. Abciximab should be used once only (to avoid additional risk of thrombocytopenia).

Eptifibatide (in combination with unfractionated heparin and aspirin) and tirofiban (in combination with unfractionated heparin, aspirin, and clopidogrel) also inhibit glycoprotein IIb/IIIa receptors; they are licensed for use to prevent early myocardial infarction in patients with unstable angina or non-ST-segment-elevation myocardial infarction.

Tirofiban is also licensed for use in combination with unfractionated heparin, aspirin, and clopidogrel, for the reduction of major cardiovascular events in patients with ST-segment elevation myocardial infarction intended for primary percutaneous coronary intervention.

Abciximab, eptifibatide and tirofiban should be used by specialists only.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 106 of 121

Which of the following is NOT a pharmacological effect of ACE inhibitor therapy:

a Decreased arterial resistance

b Decreased venous resistance

c Increased renal blood flow

d Decreased venous return

e Increased aldosterone release

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 106 of 121

Which of the following is NOT a pharmacological effect of ACE inhibitor therapy:

a) Decreased arterial resistance
b) Decreased venous resistance
c) Increased renal blood flow
d) Decreased venous return
e) **Increased aldosterone release** ✔

Answer

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 107 of 121

ACE inhibitors are indicated for all of the following EXCEPT for:

a Diabetic nephropathy

b Secondary prevention of cardiovascular disease

c Angina

d Heart failure

e Hypertension

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 107 of 121

ACE inhibitors are indicated for all of the following EXCEPT for:

a) Diabetic nephropathy
b) **Secondary prevention of cardiovascular disease** ✖
c) Angina ✔
d) Heart failure
e) Hypertension

Answer

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Notes

Mechanism of action

Angiotensin-converting enzyme inhibitors (ACE inhibitors) e.g. captopril inhibit the conversion of angiotensin I to angiotensin II, and thus have a vasodilatory effect, lowering both arterial and venous resistance. The cardiac output increases and, because the renovascular resistance falls, there is an increase in renal blood flow. This latter effect, together with reduced aldosterone release, increases Na+ and H2O excretion, contracting the blood volume and reducing venous return to the heart.

Blocking ACE also diminishes the breakdown of the potent vasodilator bradykinin which is the cause of the persistent dry cough. Angiotensin-II receptor blockers do not have this effect, therefore they are useful alternative for patients who have to discontinue an ACE inhibitor because of persistent cough.

Indications

ACE inhibitors have many uses and are generally well tolerated. They are indicated for:

- Heart failure
- Hypertension
- Diabetic nephropathy
- Secondary prevention of cardiovascular events

Contraindications

ACE inhibitors should be avoided in:

- History of angioedema associated with previous exposure to an ACE inhibitor
- Recurrent angioedema
- Bilateral renal artery stenosis
- Pregnancy and breastfeeding

Cautions

The use of ACE inhibitors is cautioned in:

- Renal impairment
- Afro-Caribbean patients (may respond less well to ACE inhibitors)
- Peripheral vascular disease or generalised atherosclerosis (risk of clinically silent renovascular disease)
- Primary aldosteronism (patients may respond less well to ACE inhibitors)
- History of idiopathic or hereditary angioedema
- Patients with hypertrophic cardiomyopathy
- Patients with severe or symptomatic aortic stenosis (risk of hypotension)

Concomitant treatment with NSAIDs increases the risk of renal damage, and with potassium-sparing diuretics (or potassium-containing salt substitutes) increases the risk of hyperkalaemia. Hyperkalaemia and other side effects of ACE inhibitors are more common in the elderly and in those with impaired renal function and the dose may need to be reduced.

Adverse effects

Side effects of ACE inhibitors may include:

- Deterioration in renal function
- Hyperkalaemia
- Hypotension
- Persistent dry cough
- Angioedema (non-allergic drug reaction)
- Dizziness and headaches (usually secondary to hypotension)
- Other common adverse effects include abdominal discomfort, dyspepsia, diarrhoea, nausea and vomiting, rash (in particular maculo-papular rash), myalgia, muscle spasms, dyspnoea, chest pain, and fatigue

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 108 of 121

Which of the following is NOT a typical electrolyte disturbance caused by furosemide:

a Hypercalcaemia

b Hypomagnesaemia

c Hypokalaemia

d Hypochloraemia

e Hyponatraemia

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 108 of 121

Which of the following is NOT a typical electrolyte disturbance caused by furosemide:

a) **Hypercalcaemia** ✔
b) Hypomagnesaemia
c) Hypokalaemia
d) Hypochloraemia
e) Hyponatraemia

Answer

Adverse effects of loop diuretics include:

- Mild gastrointestinal disturbances, pancreatitis and hepatic encephalopathy
- Hyperglycaemia
- Acute urinary retention
- Water and electrolyte imbalance
  - Hyponatraemia, hypocalcaemia, hypokalaemia, hypomagnesaemia, hypochloraemia
- Hypotension, hypovolaemia, dehydration, and venous thromboembolism
- Metabolic alkalosis
- Hyperuricaemia
- Blood disorders (bone marrow suppression, thrombocytopenia, and leucopenia)
- Visual disturbance, tinnitus and deafness
- Hypersensitivity reactions

Notes

Indications

Loop diuretics are powerful diuretics used in acute pulmonary oedema due to left ventricular failure; intravenous administration produces relief of breathlessness and reduces preload sooner than would be expected from the time of onset of diuresis.

They are also used in oedema in patients with chronic heart failure; diuretic-resistant oedema can be treated with a loop diuretic combined with a thiazide or related diuretic.

If necessary, a loop diuretic can be added to antihypertensive treatment to achieve better control of blood pressure in those with resistant hypertension, or in patients with impaired renal function or heart failure.

Mechanism of action

Loop diuretics inhibit the Na+/K+/2Cl- symporter on the luminal membrane in the thick ascending limb of the loop of Henle, thus preventing reabsorption of NaCl and water. These agents reduce reabsorption of Cl- and Na+ and increase Ca2+ excretion and loss of K+ and Mg2+.

Furosemide and bumetanide are similar in activity; both act within 1 hour of oral administration and diuresis is complete within 6 hours so that, if necessary, they can be given twice in one day without interfering with sleep. Following intravenous administration furosemide has a peak effect within 30 minutes. The diuresis associated with these drugs is dose related.

Contraindications

Loop diuretics are contraindicated in:

- Hypovolaemia and dehydration
- Severe hypokalaemia or severe hyponatraemia
- Anuria, acute kidney injury or chronic kidney disease due to nephrotoxic drugs
- Comatose and pre-comatose states associated with liver cirrhosis

Cautions

Loop diuretics can exacerbate diabetes (but hyperglycaemia is less likely than with thiazides) and gout.

If there is an enlarged prostate, urinary retention can occur, although this is less likely if small doses and less potent diuretics are used initially.

Hypotension, hypovolaemia and electrolyte disturbance should be corrected before initiation of treatment.

Hepatorenal syndrome; hypoproteinaemia may reduce diuretic effect and increase risk of side-effects.

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects.

Adverse effects

Adverse effects of loop diuretics include:

- Mild gastrointestinal disturbances, pancreatitis and hepatic encephalopathy
- Hyperglycaemia
- Acute urinary retention
- Water and electrolyte imbalance
  - Hyponatraemia, hypocalcaemia, hypokalaemia, hypomagnesaemia, hypochloraemia
- Hypotension, hypovolaemia, dehydration, and venous thromboembolism
- Metabolic alkalosis
- Hyperuricaemia
- Blood disorders (bone marrow suppression, thrombocytopenia, and leucopenia)
- Visual disturbance, tinnitus and deafness
- Hypersensitivity reactions

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic.

Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements. In hepatic failure, hypokalaemia caused by diuretics can precipitate encephalopathy, particularly in alcoholic cirrhosis.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 109 of 121

Regarding calcium channel blockers, which of the following statements is CORRECT:

a Nifedipine is a useful antiarrhythmic calcium channel blocker.

b Verapamil is the calcium channel blocker of choice post-myocardial infarction in patients with heart failure.

c Intravenous nimodipine is licensed for the treatment of acute life-threatening hypertension.

d Calcium channel blockers inhibit L-type voltage-sensitive calcium channels in arterial smooth muscle causing vasodilation.

e In cases of refractory hypertension, verapamil can be used in combination with a beta-blocker.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 109 of 121

Regarding calcium channel blockers, which of the following statements is CORRECT:

a) **Nifedipine is a useful antiarrhythmic calcium channel blocker.** ✖

b)
Verapamil is the calcium channel blocker of choice post-myocardial infarction in patients with heart failure.

c) Intravenous nimodipine is licensed for the treatment of acute life-threatening hypertension.

d) ✔
Calcium channel blockers inhibit L-type voltage-sensitive calcium channels in arterial smooth muscle causing vasodilation.

e) In cases of refractory hypertension, verapamil can be used in combination with a beta-blocker.

Answer

Calcium channel blockers inhibit L-type voltage-sensitive calcium channels in arterial smooth muscle, causing relaxation and vasodilation. They also block calcium channels within the myocardium and conducting tissues of the heart which produces a negative inotropic effect by reducing calcium influx during the plateau phase of the action potential. Verapamil is highly negatively inotropic and reduces cardiac output, slows the heart rate and may impair atrioventricular conduction. It may precipitate heart failure, exacerbate conduction disorders, and cause hypotension at high doses and should not be used with beta-blockers. Nifedipine has less myocardial effects than verapamil and has no antiarrhythmic properties but has more influence on the vessels. Nimodipine is used solely for the prevention and treatment of vascular spasm following aneurysmal subarachnoid haemorrhage.

Notes

Calcium channel blockers are widely used in the treatment of angina (second line to beta-blockers) and also for hypertension, heart failure and arrhythmias.

Calcium channel blockers vary widely in their predilection for the various possible sites of action and in their therapeutic effects and may be divided into the dihydropyridine type (e.g. amlodipine, nifedipine and nimodipine) and the rate-limiting non-dihydropyridine type (e.g. verapamil, diltiazem).

Mechanism of action

Calcium channel blockers inhibit L-type voltage-sensitive calcium channels in arterial smooth muscle, causing relaxation and vasodilation. They also block calcium channels within the myocardium and conducting tissues of the heart which produces a negative inotropic effect by reducing calcium influx during the plateau phase of the action potential.

The dihydropyridines have relatively little effect on the heart because they have a much higher affinity for inactivated channels found more frequently in vascular muscle. Furthermore, at clinical doses, vasodilation results in a reflex increase in sympathetic tone that counteracts the mild negative inotropic effect. The non-dihydropyridines are rate-limiting calcium-channel blockers that depress the sinus node and slow conduction in the atrioventricular node, causing a mild resting bradycardia.

Contraindications

Non-dihydropyridine CCBs:

- Atrial flutter or fibrillation
- Heart failure or history of heart failure (may precipitate or aggravate symptoms)
- Cardiac outflow obstruction e.g. significant aortic stenosis or obstructive hypertrophic cardiomyopathy (vasodilation may result in reduced cardiac output)
- Second or third degree AV block (may induce complete AV block)
- Severe bradycardia
- Sick sinus syndrome

Dihydropyridine CCBs:

- Uncontrolled heart failure
- Severe hypotension
- Cardiac outflow obstruction

Adverse effects

- Gastrointestinal adverse effects – constipation, nausea, dyspepsia
- Bradycardia, AV block, reflex tachycardia, palpitations
- Vasodilatory adverse effects – flushing, dizziness, headache, postural hypotension, ankle swelling (more common with dihydropyridine calcium-channel blockers and often improve with continued use, although ankle swelling often persists)
- Gingival hyperplasia
- Malaise and fatigue
- Myalgia and arthralgia

Verapamil

Verapamil is used for the treatment of angina, hypertension, and arrhythmias. Verapamil is highly negatively inotropic and reduces cardiac output, slows the heart rate and may impair atrioventricular conduction. It may precipitate heart failure, exacerbate conduction disorders, and cause hypotension at high doses and should not be used with beta-blockers. Constipation is the most common side effect.

Nifedipine

Nifedipine relaxes vascular smooth muscle and dilates coronary and peripheral arteries. Nifedipine has less myocardial effects than verapamil and has no antiarrhythmic properties but has more influence on the vessels. Unlike verapamil it rarely precipitates heart failure because any negative inotropic effect is offset by a reduction in left ventricular work.

Nimodipine

Nimodipine is related to nifedipine but the smooth muscle relaxant effects preferentially act on cerebral arteries. It is used solely for the prevention and treatment of vascular spasm following aneurysmal subarachnoid haemorrhage.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 110 of 121

Regarding statins, which of the following statements is INCORRECT:

a Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase.

b Statins should be avoided in patients with active liver disease.

c Statins are more effective than fibrates at lowering triglycerides.

d Statins are contraindicated in pregnancy.

e Statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 110 of 121

Regarding statins, which of the following statements is INCORRECT:

a)
Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase.

b) Statins should be avoided in patients with active liver disease.

c) Statins are more effective than fibrates at lowering triglycerides.

d) Statins are contraindicated in pregnancy.

e)
Statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Answer

Statins are more effective than other lipid-regulating drugs at lowering LDL-cholesterol concentration but they are less effective than the fibrates in reducing triglyceride concentration. However, statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Notes

Statins may be used for primary or secondary prevention of cardiovascular disease and for treatment of primary or familial hypercholesterolaemia.

Statins are more effective than other lipid-regulating drugs at lowering LDL-cholesterol concentration but they are less effective than the fibrates in reducing triglyceride concentration. However, statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Mechanism of action

Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase, an enzyme involved in cholesterol synthesis. Inhibition of HMG CoA reductase reduces low-density lipoprotein (LDL) cholesterol levels by slowing down the production of cholesterol in the liver and increasing the liver's ability to remove the LDL cholesterol already in the blood.

Indications

Statins should be offered to all patients, including the elderly, with cardiovascular disease such as those with coronary heart disease (including history of angina or acute myocardial infarction) or occlusive arterial disease (including peripheral vascular disease, non-haemorrhagic stroke, or transient ischaemic attacks). The use of statins should be considered in patients with a high risk of developing cardiovascular disease (primary prevention) which can be assessed using risk calculators.

Contraindications

Statins should be avoided in:

- People with active liver disease
- People with transaminase (alanine aminotransferase or aspartate aminotransferase) levels that are three or more times the upper limit of normal
- Pregnant or breastfeeding women (discontinue 3 months before attempting to conceive)

Cautions

Statins should be used with caution in people:

- With a history of liver disease
- Who consume high level of alcohol
- With predisposing factors for rhabdomyolysis such as older age (> 70 years), concomitant use with an interacting drug, renal impairment, hypothyroidism, and personal or familial history of hereditary muscular disorders

Adverse effects

Adverse effects of statins include:

- Headache
- Epistaxis
- Gastrointestinal disorders (such as constipation, flatulence, dyspepsia, nausea, and diarrhoea)
- Musculoskeletal and connective tissue disorders (such as myalgia, arthralgia, pain in the extremity, muscle spasms, joint swelling, and back pain)
- Hyperglycaemia and diabetes
- Myopathy and rhabdomyolysis
- Interstitial lung disease
- Hepatotoxicity

Muscle effects

The risk of myopathy, myositis, and rhabdomyolysis associated with statin use is rare. Although myalgia has been reported commonly in patients receiving statins, muscle toxicity truly attributable to statin use is rare.

Muscle toxicity can occur with all statins, however the likelihood increases with higher doses and in certain patients. Statins should be used with caution in patients at increased risk of muscle toxicity, including those with a personal or family history of muscular disorders, previous history of muscular toxicity, a high alcohol intake, renal impairment or hypothyroidism.

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 111 of 121

Digoxin is predominantly used for which of the following:

a Rate control in paroxysmal atrial fibrillation

b Acute treatment of new-onset fast atrial fibrillation

c First line treatment for heart failure

d Termination of supraventricular tachycardia associated with Wolff-Parkinson-White syndrome

e Rate control in persistent and permanent atrial fibrillation

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 111 of 121

Digoxin is predominantly used for which of the following:

a) Rate control in paroxysmal atrial fibrillation
b) Acute treatment of new-onset fast atrial fibrillation
c) **First line treatment for heart failure** ✖
d) Termination of supraventricular tachycardia associated with Wolff-Parkinson-White syndrome
e) Rate control in persistent and permanent atrial fibrillation ✔

Answer

Digoxin is most useful for controlling the ventricular response in persistent and permanent atrial fibrillation and atrial flutter. Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation. It is now rarely used for rapid control of heart rate, as even with intravenous administration, response may take many hours. Digoxin is reserved for patients with worsening or severe heart failure due to left ventricular systolic dysfunction refractory to combination therapy with first-line agents. Digoxin is contraindicated in supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome.

Notes

Digoxin is a cardiac glycoside that increases the force of myocardial contraction (positive inotrope), and slows the heart rate (negative chronotrope). Digoxin has a narrow therapeutic index; digoxin toxicity can occur even when the serum digoxin concentration is within the therapeutic range (between 0.7 – 2.0 mcg/L).

Mechanism of action

Inotropic effect:

Digoxin inhibits membrane Na+/K+ ATPase, which is responsible for Na+/K+ exchange across the myocyte cell membrane. This increases intracellular Na+ and produces a secondary increase in intracellular Ca2+ that increases the force of myocardial contraction. The increase in intracellular Ca2+ occurs because the decreased Na+ gradient across the membrane reduces the extrusion of Ca2+ by the Na+/Ca2+ exchanger that normally occurs during diastole. Digoxin and K+ ions compete for the receptor on the outside of the muscle cell membrane, and so the effects of digoxin may be dangerously increased in hypokalaemia.

Chronotropic effect:

Digoxin stimulates vagal activity , causing the release of ACh, which slows the heart rate, slows atrioventricular conduction and prolongs the refractory period in the AVN and bundle of His. By delaying AV conduction, digoxin increases the degree of block, and slows and strengthens the ventricular beat.

Indications

Digoxin is most useful for controlling the ventricular response in persistent and permanent atrial fibrillation and atrial flutter. Digoxin is usually only effective for controlling the ventricular rate at rest, and should therefore only be used as monotherapy in predominantly sedentary patients with non-paroxysmal atrial fibrillation. It is now rarely used for rapid control of heart rate, as even with intravenous administration, response may take many hours.

Digoxin also has a role in the management of heart failure; digoxin improves symptoms of heart failure and exercise tolerance and reduces hospitalisation due to acute exacerbations but it does not reduce mortality. Digoxin is reserved for patients with worsening or severe heart failure due to left ventricular systolic dysfunction refractory to combination therapy with first-line agents.

Contraindications

Digoxin is contraindicated in:

- Supraventricular arrhythmias associated with accessory conduction pathways e.g. Wolff-Parkinson-White syndrome
- Ventricular tachycardia or fibrillation
- Heart conduction problems e.g. second degree or intermittent complete heart block
- Hypertrophic cardiomyopathy (unless concomitant atrial fibrillation and heart failure but should be used with caution)

Cautions

Digoxin should be used with caution in:

- Hypercalcaemia (risk of digitalis toxicity)
- Hypokalaemia (risk of digitalis toxicity; diuretics may predispose to hypokalaemia)
- Hypomagnesaemia (risk of digitalis toxicity)
- Hypoxia (risk of digitalis toxicity)
- Recent myocardial infarction
- Severe respiratory disease
- Sick sinus syndrome
- Thyroid disease
- Constrictive pericarditis
- Renal impairment (reduce dose and monitor plasma-digoxin concentration; toxicity increased by electrolyte disturbances)
- Elderly people (reduce dose)
- Concomitant drug therapy with drugs which may increase plasma concentration of digoxin e.g. amiodarone, antimicrobials, calcium-channel blockers, spironolactone

Adverse effects

The adverse effects of digoxin are frequently due to its narrow therapeutic window and include:

- Cardiac adverse effects
  - Sinoatrial and atrioventricular block
  - Premature ventricular contractions
  - PR prolongation and ST-segment depression
- Nausea, vomiting and diarrhoea
- Blurred or yellow vision
- CNS effects
  - weakness, dizziness, confusion, apathy, malaise, headache, depression, psychosis
- Thrombocytopenia and agranulocytosis (rare)
- Gynaecomastia in men in prolonged administration

Digoxin toxicity

Unwanted effects of digoxin depend on both the plasma concentration of digoxin (increasing risk of toxicity through the range 1.5 – 3 mcg/L) and on the sensitivity of the conducting system or of the myocardium, which is often increased in heart disease. Hypoxia, hypercalcaemia, hypokalaemia and hypomagnesaemia predispose to digoxin toxicity. Care should also be taken in the elderly who are particularly susceptible to digoxin toxicity.

If toxicity occurs, digoxin should be withdrawn. Digoxin-specific antibody fragments are indicated for the treatment of known or strongly suspected life-threatening digoxin toxicity associated with ventricular arrhythmias or bradyarrhythmias unresponsive to atropine sulfate and when measures beyond the withdrawal of digoxin and correction of any electrolyte abnormalities are considered necessary.

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

< Previous | Next >

Something wrong?

Pharmacology: Cardiovascular

Question 112 of 121

Loop diuretics act primarily at which of the following sites in the nephron:

a Proximal tubule

b Thick ascending limb

c Collecting ducts

d Thin ascending limb

e Descending limb

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 112 of 121

Loop diuretics act primarily at which of the following sites in the nephron:

a) **Proximal tubule** ✗
b) Thick ascending limb ✓
c) Collecting ducts
d) Thin ascending limb
e) Descending limb

Answer

Loop diuretics inhibit the Na+/K+/2Cl- symporter on the luminal membrane in the thick ascending limb of the loop of Henle, thus preventing reabsorption of NaCl and water.

Notes

Indications

Loop diuretics are powerful diuretics used in acute pulmonary oedema due to left ventricular failure; intravenous administration produces relief of breathlessness and reduces preload sooner than would be expected from the time of onset of diuresis.

They are also used in oedema in patients with chronic heart failure; diuretic-resistant oedema can be treated with a loop diuretic combined with a thiazide or related diuretic.

If necessary, a loop diuretic can be added to antihypertensive treatment to achieve better control of blood pressure in those with resistant hypertension, or in patients with impaired renal function or heart failure.

Mechanism of action

Loop diuretics inhibit the Na+/K+/2Cl- symporter on the luminal membrane in the thick ascending limb of the loop of Henle, thus preventing reabsorption of NaCl and water. These agents reduce reabsorption of Cl- and Na+ and increase Ca2+ excretion and loss of K+ and Mg2+.

Furosemide and bumetanide are similar in activity; both act within 1 hour of oral administration and diuresis is complete within 6 hours so that, if necessary, they can be given twice in one day without interfering with sleep. Following intravenous administration furosemide has a peak effect within 30 minutes. The diuresis associated with these drugs is dose related.

Contraindications

Loop diuretics are contraindicated in:

- Hypovolaemia and dehydration
- Severe hypokalaemia or severe hyponatraemia
- Anuria, acute kidney injury or chronic kidney disease due to nephrotoxic drugs
- Comatose and pre-comatose states associated with liver cirrhosis

Cautions

Loop diuretics can exacerbate diabetes (but hyperglycaemia is less likely than with thiazides) and gout.

If there is an enlarged prostate, urinary retention can occur, although this is less likely if small doses and less potent diuretics are used initially.

Hypotension, hypovolaemia and electrolyte disturbance should be corrected before initiation of treatment.

Hepatorenal syndrome; hypoproteinaemia may reduce diuretic effect and increase risk of side-effects.

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects.

Adverse effects

Adverse effects of loop diuretics include:

- Mild gastrointestinal disturbances, pancreatitis and hepatic encephalopathy
- Hyperglycaemia
- Acute urinary retention
- Water and electrolyte imbalance
  - Hyponatraemia, hypocalcaemia, hypokalaemia, hypomagnesaemia, hypochloraemia
- Hypotension, hypovolaemia, dehydration, and venous thromboembolism
- Metabolic alkalosis
- Hyperuricaemia
- Blood disorders (bone marrow suppression, thrombocytopenia, and leucopenia)
- Visual disturbance, tinnitus and deafness
- Hypersensitivity reactions

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic.

Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements. In hepatic failure, hypokalaemia caused by diuretics can precipitate encephalopathy, particularly in alcoholic cirrhosis.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 113 of 121

What is the main mechanism of action of vasoconstrictor sympathomimetics:

a Alpha-receptor agonist

b Dopamine receptor agonist

c Beta1-receptor agonist

d Alpha-receptor antagonist

e Beta2-receptor agonist

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 113 of 121

What is the main mechanism of action of vasoconstrictor sympathomimetics:

a) Alpha-receptor agonist ✔
b) Dopamine receptor agonist
c) Beta1-receptor agonist
d) **Alpha-receptor antagonist** ✖
e) Beta2-receptor agonist

Answer

Vasoconstrictor sympathomimetics, such as ephedrine and metaraminol, raise blood pressure transiently by acting on alpha-adrenergic receptors to constrict peripheral vessels. They are sometimes used as an emergency method of elevating blood pressure where other measures have failed. Their use is limited as although they raise the blood pressure they also reduce organ perfusion.

Notes

Shock is a medical emergency associated with a high mortality. The underlying causes of shock such as haemorrhage, sepsis, or myocardial insufficiency should be corrected. The profound hypotension of shock must be treated promptly to prevent tissue hypoxia and organ failure. Volume replacement is essential to correct the hypovolaemia associated with haemorrhage and sepsis but may be detrimental in cardiogenic shock.

Inotropic sympathomimetics

Depending on haemodynamic status, cardiac output may be improved by the use of sympathomimetic inotropes such as adrenaline/epinephrine, dobutamine or dopamine.

In septic shock, when fluid replacement and inotropic support fail to maintain blood pressure, the vasoconstrictor noradrenaline/norepinephrine may be considered. In cardiogenic shock peripheral resistance is frequently high and to raise it further may worsen myocardial performance and exacerbate tissue ischaemia.

- Dobutamine directly stimulates the beta1-adrenergic receptors in the heart and increases contractility and cardiac output with little effect on the rate. In addition action on beta2-receptors causes vasodilation.
- Dopamine is a neurotransmitter and a metabolic precursor of the catecholamines. It acts on beta1-receptors in cardiac muscle increasing cardiac contractility, and increases renal perfusion by stimulating dopamine receptors in the renal vasculature. This is of benefit in cardiogenic shock where deterioration of renal function is common.
- Epinephrine increases blood pressure by stimulating the rate and force of the heartbeat (beta1-effects). Stimulation of vascular alpha-receptors causes vasoconstriction (viscera, skin) but beta-2 receptor stimulation causes vasodilation (skeletal muscle) and the total peripheral resistance may actually decrease.
- Norepinephrine has little or no effect on the vascular beta2-receptors, and so the alpha-mediated vasoconstriction is unopposed. The resulting rise in blood pressure reflexively slows the heart.

The use of sympathomimetic inotropes and vasoconstrictors should preferably be confined to the intensive care setting and undertaken with invasive haemodynamic monitoring.

Vasoconstrictor sympathomimetics

Vasoconstrictor sympathomimetics, such as ephedrine and metaraminol, raise blood pressure transiently by acting on alpha-adrenergic receptors to constrict peripheral vessels. They are sometimes used as an emergency method of elevating blood pressure where other measures have failed. Their use is limited as although they raise the blood pressure they also reduce organ perfusion.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 114 of 121

What is the recommended dosing regime for adenosine in the treatment of a stable regular narrow-complex tachycardia:

a Adenosine 6 mg IV bolus, followed by a maximum of two further 6 mg boluses if no response

b Adenosine 12 mg IV bolus, followed by one further 12 mg bolus if required

c Adenosine 12 mg IV bolus followed by a maximum of two further 12 mg boluses if no response

d Adenosine 6 mg IV bolus, followed by a 12 mg bolus and one further 12 mg bolus if required

e Adenosine 12 mg IV bolus, followed by 6 mg bolus if no response

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 114 of 121

What is the recommended dosing regime for adenosine in the treatment of a stable regular narrow-complex tachycardia:

a) ✖
Adenosine 6 mg IV bolus, followed by a maximum of two further 6 mg boluses if no response

b) Adenosine 12 mg IV bolus, followed by one further 12 mg bolus if required

c) Adenosine 12 mg IV bolus followed by a maximum of two further 12 mg boluses if no response

d) Adenosine 6 mg IV bolus, followed by a 12 mg bolus and one further 12 mg bolus if required ✔

e) Adenosine 12 mg IV bolus, followed by 6 mg bolus if no response

Answer

The first step in treatment of regular narrow-complex tachycardias is to attempt vagal manoeuvres (carotid sinus massage or Valsalva manoeuvre). If the tachyarrhythmia persists, adenosine 6 mg IV should be given as a rapid bolus using a large cannula and a large vein. If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg).

Notes

The approach to the management of tachycardias should follow the Resuscitation Council guidelines.

If the patient has adverse features

Adverse features:

- Shock (hypotension, pallor, sweating, cold extremities, confusion, impaired consciousness)
- Syncope (transient loss of consciousness)
- Heart failure (pulmonary oedema, raised JVP, peripheral oedema, hepatomegaly)
- Myocardial ischaemia (ischaemic chest pain, ischaemic changes on ECG)

If any **adverse features** are present, **emergency cardioversion with a synchronised DC shock** is indicated. If cardioversion fails to terminate the arrhythmia and adverse features persist, amiodarone 300 mg IV over 10 – 20 mins should be given and further cardioversion attempted. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h, given via a large vein.

If the patient has no adverse features

If the patient is stable, the QRS duration should be considered.

- If the QRS duration is 0.12 seconds or greater, it is a broad-complex tachycardia.
- If the QRS complex is less than 0.12 seconds, it is a narrow-complex tachycardia.

Broad-complex tachycardia

Broad-complex tachycardias are mostly ventricular in origin but may be a supraventricular rhythm with aberrant conduction.

- A regular broad-complex tachycardia is likely to be ventricular tachycardia or a regular supraventricular rhythm with bundle branch block.
  - A **ventricular tachycardia (or broad-complex tachycardia of uncertain origin**) should be treated with **amiodarone 300 mg IV over 20 – 60 min, followed by an infusion of 900 mg over the next 24 hours**.
  - If previously confirmed as SVT with bundle branch block, the patient should be treated as for narrow-complex tachycardia.
- A stable patient with an irregular broad-complex tachycardia is most likely to be in AF with bundle branch block, although AF with ventricular pre-excitation or polymorphic VT (torsades de pointes) is a possibility.
  - Expert help should be sought for the assessment and treatment of irregular broad-complex tachycardia.
  - **Torsade de pointes VT** should be treated by stopping all drugs known to prolong the QT interval, correcting electrolyte abnormalities, and giving **magnesium sulfate 2 g IV over 10 minutes**. Expert help should be sought as other treatment options including overdrive pacing may be required to prevent relapse once the arrhythmia has been corrected.

Narrow-complex tachycardia

The narrow-complex tachycardias are supraventricular in origin.

- A regular narrow-complex tachycardia may represent paroxysmal SVT or atrial flutter with 2:1 conduction, it may be difficult to differentiate between the two.
  - The first step in treatment of **regular narrow-complex tachycardias** is to attempt **vagal manoeuvres** (carotid sinus massage or Valsalva manoeuvre).
  - If the tachyarrhythmia persists, **adenosine 6 mg IV** should be given as a rapid bolus using a large cannula and a large vein. The patient should be warned that they will feel unwell and may experience chest discomfort for a few seconds following the injection. An ECG (preferably multi-lead) should be recorded during the injection.
  - If the ventricular rate slows transiently and then speeds up again, this may indicate atrial activity such as atrial flutter or other atrial tachycardia, and this should be treated accordingly.
  - If there is no response (i.e. no transient slowing or termination of the tachyarrhythmia) to adenosine 6 mg IV, a 12 mg IV bolus should be given and if there is no response, one further 12 mg IV bolus given (max 30 mg). Lack of response to adenosine will occur if the bolus is given too slowly or into a peripheral vein.
  - If adenosine is contraindicated, or fails to terminate a regular narrow-complex tachycardia, the administration of verapamil 2.5 – 5 mg IV over 2 mins should be considered.
- Irregular narrow-complex tachycardia is most likely to be AF with fast ventricular response or, less commonly, atrial flutter with variable AV conduction.
  - Immediate treatment options include rate control with drug therapy, rhythm control using drugs to achieve chemical cardioversion, rhythm control by synchronised cardioversion and treatment to prevent complications (e.g. anticoagulation). Expert help should be sought in determining the most appropriate treatment for the individual patient.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 115 of 121

Which of the following drug classes is used first line in the management of hypertensive episodes in pheochromocytoma:

a Beta-blockers

b Alpha-blockers

c Calcium channel blockers

d ACE inhibitors

e Thiazide diuretics

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 115 of 121

Which of the following drug classes is used first line in the management of hypertensive episodes in pheochromocytoma:

a) Beta-blockers
b) **Alpha-blockers** ✔
c) Calcium channel blockers
d) ACE inhibitors
e) Thiazide diuretics

Answer

Long term management of pheochromocytoma involves surgery. However surgery cannot take place until there is adequate blockade of both alpha- and beta- adrenoceptors. Alpha-blockers are used in the short-term management of hypertensive episodes in pheochromocytoma. Once alpha blockade is established, tachycardia can be controlled by the cautious addition of a beta-blocker; a cardioselective beta-blocker is preferred.

Phenoxybenzamine hydrochloride, a powerful alpha-blocker, is effective in the management of phaeochromocytoma but it has many side-effects. Phentolamine mesilate is a short-acting alpha-blocker used mainly during surgery of phaeochromocytoma; its use for the diagnosis of phaeochromocytoma has been superseded by measurement of catecholamines in blood and urine.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 116 of 121

What is the mechanism of aspirin as an anti-platelet:

a Inhibition of platelet thromboxane A2 synthesis

b Inhibition of binding of ADP to its platelet receptor

c Inhibition of GPIIb/IIIa receptor sites

d Inhibition of the breakdown of cAMP

e Inhibition of thrombin-induced platelet aggregation

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 116 of 121

What is the mechanism of aspirin as an anti-platelet:

a) **Inhibition of platelet thromboxane A2 synthesis** ✔
b) Inhibition of binding of ADP to its platelet receptor
c) Inhibition of GPIIb/IIIa receptor sites
d) Inhibition of the breakdown of cAMP
e) Inhibition of thrombin-induced platelet aggregation

Answer

Aspirin irreversibly inhibits cyclo-oxygenase and blocks the platelet production of thromboxane A2 (TXA2), thus inhibiting platelet aggregation.

Notes

Antiplatelet drugs decrease platelet aggregation and inhibit thrombus formation in the arterial circulation, because in faster-flowing vessels, thrombi are composed mainly of platelets with little fibrin.

Mechanism of action

Aspirin irreversibly inhibits cyclo-oxygenase and blocks the platelet production of thromboxane A2 (TXA2), a powerful inducer of platelet aggregation. The endothelial cells of the vascular wall produce a prostaglandin, prostacyclin (PGI2), which is a physiological antagonist of TXA2, causing inhibition of platelet aggregation. Platelets cannot synthesise new enzyme but the vascular endothelial cells can, and the balance is shifted to the anti-aggregatory effects of PGI2.

Indications

Low-dose aspirin may be indicated in:

- Primary prevention of cardiovascular events in some people when the risk is particularly high
- Secondary prevention of cardiovascular events in people with:
  - Angina
  - Myocardial infarction
  - Stroke and transient ischaemic attack
  - Peripheral arterial disease
  - Atrial fibrillation (although anticoagulants are usually used)

Contraindications

Low-dose aspirin should be avoided in:

- People with a history of true hypersensitivity to aspirin or salicylates (symptoms of hypersensitivity to aspirin or salicylates include bronchospasm, urticaria, angioedema, and vasomotor rhinitis)
- People with active pathological bleeding, such as peptic ulcer or intracranial haemorrhage
- People with suspected stroke, until intracranial haemorrhage has been excluded by brain imaging
- People with haemophilia or another haemorrhagic disorder (including thrombocytopenia)
- Children younger than 16 years of age

Cautions

Low-dose aspirin should be used with caution in:

- People who may be at high risk of increased bleeding — for example those receiving treatment with warfarin, NSAIDs, corticosteroids, or other drugs known to increase bleeding
- People with asthma (may precipitate bronchospasm)
- People with uncontrolled blood pressure
  - If using for primary prevention of cardiovascular events, do not initiate aspirin until blood pressure is less than 150/90 mmHg
  - For secondary prevention, benefits of antiplatelet treatment outweigh risks, and treatment should not be delayed while controlling blood pressure

Adverse effects

Low-dose aspirin may result in:

- Increased absolute risk of major bleeding, major gastrointestinal bleeding, and intracranial bleeding
- Gastrointestinal adverse effects including bleeding, ulceration and dyspepsia
- Bronchospasm and asthma attacks in patients with asthma

Interactions

The risk of bleeding is increased when low-dose aspirin is combined with other drugs that can increase the risk of bleeding such as other antiplatelet drugs, NSAIDs, oral and parenteral anticoagulants, selective serotonin reuptake inhibitors (SSRIs) and corticosteroids. Consider the need for gastroprotection with a proton pump inhibitor (such as omeprazole) or a histamine antagonist (such as ranitidine).

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 117 of 121

Statins are contraindicated in which of the following:

a Active liver disease

b Asthma

c Renal artery stenosis

d Chronic kidney disease

e Recurrent angioedema

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 117 of 121

Statins are contraindicated in which of the following:

a) **Active liver disease** ✔
b) Asthma
c) Renal artery stenosis
d) Chronic kidney disease
e) Recurrent angioedema

Answer

Statins should be avoided in:

- People with active liver disease
- People with transaminase (alanine aminotransferase or aspartate aminotransferase) levels that are three or more times the upper limit of normal
- Pregnant or breastfeeding women (discontinue 3 months before attempting to conceive)

Notes

Statins may be used for primary or secondary prevention of cardiovascular disease and for treatment of primary or familial hypercholesterolaemia.

Statins are more effective than other lipid-regulating drugs at lowering LDL-cholesterol concentration but they are less effective than the fibrates in reducing triglyceride concentration. However, statins reduce cardiovascular disease events and total mortality irrespective of the initial cholesterol concentration.

Mechanism of action

Statins competitively inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase, an enzyme involved in cholesterol synthesis. Inhibition of HMG CoA reductase reduces low-density lipoprotein (LDL) cholesterol levels by slowing down the production of cholesterol in the liver and increasing the liver's ability to remove the LDL cholesterol already in the blood.

Indications

Statins should be offered to all patients, including the elderly, with cardiovascular disease such as those with coronary heart disease (including history of angina or acute myocardial infarction) or occlusive arterial disease (including peripheral vascular disease, non-haemorrhagic stroke, or transient ischaemic attacks). The use of statins should be considered in patients with a high risk of developing cardiovascular disease (primary prevention) which can be assessed using risk calculators.

Contraindications

Statins should be avoided in:

- People with active liver disease
- People with transaminase (alanine aminotransferase or aspartate aminotransferase) levels that are three or more times the upper limit of normal
- Pregnant or breastfeeding women (discontinue 3 months before attempting to conceive)

Cautions

Statins should be used with caution in people:

- With a history of liver disease
- Who consume high level of alcohol
- With predisposing factors for rhabdomyolysis such as older age (> 70 years), concomitant use with an interacting drug, renal impairment, hypothyroidism, and personal or familial history of hereditary muscular disorders

Adverse effects

Adverse effects of statins include:

- Headache
- Epistaxis
- Gastrointestinal disorders (such as constipation, flatulence, dyspepsia, nausea, and diarrhoea)
- Musculoskeletal and connective tissue disorders (such as myalgia, arthralgia, pain in the extremity, muscle spasms, joint swelling, and back pain)
- Hyperglycaemia and diabetes
- Myopathy and rhabdomyolysis
- Interstitial lung disease
- Hepatotoxicity

Muscle effects

The risk of myopathy, myositis, and rhabdomyolysis associated with statin use is rare. Although myalgia has been reported commonly in patients receiving statins, muscle toxicity truly attributable to statin use is rare.

Muscle toxicity can occur with all statins, however the likelihood increases with higher doses and in certain patients. Statins should be used with caution in patients at increased risk of muscle toxicity, including those with a personal or family history of muscular disorders, previous history of muscular toxicity, a high alcohol intake, renal impairment or hypothyroidism.

There is an increased incidence of myopathy if a statin is given with a fibrate, with lipid-lowering doses of nicotinic acid, with fusidic acid, or with drugs that increase the plasma-statin concentration, such as macrolide antibiotics (erythromycin and clarithromycin), imidazole and triazole antifungals, and ciclosporin; close monitoring of liver function and, if muscular symptoms occur, of creatine kinase is necessary.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 118 of 121

Regarding loop diuretics, which of the following statements is INCORRECT:

a In hepatic failure, hypokalaemia caused by diuretics can precipitate encephalopathy.

b Oral bumetanide acts within 1 hour and diuresis is complete within 6 hours.

c Intravenous furosemide has a peak effect within 30 minutes.

d Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects.

e The risk of hypokalaemia is greater with loop diuretics than with an equipotent dose of a thiazide diuretic.

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 118 of 121

Regarding loop diuretics, which of the following statements is INCORRECT:

a) ✖
In hepatic failure, hypokalaemia caused by diuretics can precipitate encephalopathy.

b) Oral bumetanide acts within 1 hour and diuresis is complete within 6 hours.

c) Intravenous furosemide has a peak effect within 30 minutes.

d)
Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects.

e) ✔
The risk of hypokalaemia is greater with loop diuretics than with an equipotent dose of a thiazide diuretic.

Answer

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic.

Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements. In hepatic failure, hypokalaemia caused by diuretics can precipitate encephalopathy, particularly in alcoholic cirrhosis.

Notes

Indications

Loop diuretics are powerful diuretics used in acute pulmonary oedema due to left ventricular failure; intravenous administration produces relief of breathlessness and reduces preload sooner than would be expected from the time of onset of diuresis.

They are also used in oedema in patients with chronic heart failure; diuretic-resistant oedema can be treated with a loop diuretic combined with a thiazide or related diuretic.

If necessary, a loop diuretic can be added to antihypertensive treatment to achieve better control of blood pressure in those with resistant hypertension, or in patients with impaired renal function or heart failure.

Mechanism of action

Loop diuretics inhibit the Na+/K+/2Cl- symporter on the luminal membrane in the thick ascending limb of the loop of Henle, thus preventing reabsorption of NaCl and water. These agents reduce reabsorption of Cl- and Na+ and increase Ca2+ excretion and loss of K+ and Mg2+.

Furosemide and bumetanide are similar in activity; both act within 1 hour of oral administration and diuresis is complete within 6 hours so that, if necessary, they can be given twice in one day without interfering with sleep. Following intravenous administration furosemide has a peak effect within 30 minutes. The diuresis associated with these drugs is dose related.

Contraindications

Loop diuretics are contraindicated in:

- Hypovolaemia and dehydration
- Severe hypokalaemia or severe hyponatraemia
- Anuria, acute kidney injury or chronic kidney disease due to nephrotoxic drugs
- Comatose and pre-comatose states associated with liver cirrhosis

Cautions

Loop diuretics can exacerbate diabetes (but hyperglycaemia is less likely than with thiazides) and gout.

If there is an enlarged prostate, urinary retention can occur, although this is less likely if small doses and less potent diuretics are used initially.

Hypotension, hypovolaemia and electrolyte disturbance should be corrected before initiation of treatment.

Hepatorenal syndrome; hypoproteinaemia may reduce diuretic effect and increase risk of side-effects.

Lower initial doses of diuretics should be used in the elderly because they are particularly susceptible to the side effects.

Adverse effects

Adverse effects of loop diuretics include:

- Mild gastrointestinal disturbances, pancreatitis and hepatic encephalopathy
- Hyperglycaemia
- Acute urinary retention
- Water and electrolyte imbalance
  - Hyponatraemia, hypocalcaemia, hypokalaemia, hypomagnesaemia, hypochloraemia
- Hypotension, hypovolaemia, dehydration, and venous thromboembolism
- Metabolic alkalosis
- Hyperuricaemia
- Blood disorders (bone marrow suppression, thrombocytopenia, and leucopenia)
- Visual disturbance, tinnitus and deafness
- Hypersensitivity reactions

Hypokalaemia

Hypokalaemia can occur with both thiazide and loop diuretics. The risk of hypokalaemia depends on the duration of action as well as the potency and is thus greater with thiazides than with an equipotent dose of a loop diuretic.

Hypokalaemia is dangerous in severe cardiovascular disease and in patients also being treated with cardiac glycosides. Often the use of potassium-sparing diuretics avoids the need to take potassium supplements. In hepatic failure, hypokalaemia caused by diuretics can precipitate encephalopathy, particularly in alcoholic cirrhosis.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 119 of 121

All of the following are indications for beta-blockers EXCEPT for:

a Anxiety

b Pheochromocytoma

c Prophylaxis of migraine

d Raynaud's disease

e Hypertension

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 119 of 121

All of the following are indications for beta-blockers EXCEPT for:

a) Anxiety
b) Pheochromocytoma
c) **Prophylaxis of migraine** ✗
d) Raynaud's disease ✓
e) Hypertension

Answer

Beta-blockers are contraindicated in Raynaud's syndrome.

Beta-blockers may be indicated in:

- Hypertension
- Pheochromocytoma (only with an alpha-blocker)
- Angina
- Secondary prevention after ACS
- Arrhythmias including atrial fibrillation
- Heart failure
- Thyrotoxicosis
- Anxiety
- Prophylaxis of migraine
- Essential tremor
- Glaucoma

Notes

Beta-blockers block the beta-adrenoceptors in the heart, peripheral vasculature, bronchi, pancreas and liver.

Therapeutic effects

- Cardiovascular system
  - Reduce blood pressure
  - Reduce heart rate, contractility and cardiac output
  - Increase AV conduction time, refractoriness and suppress automaticity
- Eye
  - Reduce intraocular pressure
- Respiratory system
  - Cause bronchoconstriction

Type examples

Many beta-blockers are now available and in general they are all equally effective. There are, however, differences between them, which may affect choice in treating particular diseases or individual patients.

Sotalol hydrochloride, a non-cardioselective beta-blocker with additional class III antiarrhythmic activity, is used for prophylaxis in paroxysmal supraventricular arrhythmias. It also suppresses ventricular ectopic beats and nonsustained ventricular tachycardia. It has been shown to be more effective than lidocaine in the termination of spontaneous sustained ventricular tachycardia due to coronary disease or cardiomyopathy. However, it may prolong the QT-interval and induce torsade de pointes in susceptible patients.

Labetalol has, in addition to other beta-blocker effects, an arteriolar vasodilating action by diverse mechanisms, and thus lowers peripheral resistance. Labetalol is useful for treating hypertensive emergencies and in the treatment of hypertension of pheochromocytoma.

Esmolol hydrochloride is a relatively cardioselective beta-blocker with a very short duration of action, used intravenously for the short-term treatment of supraventricular arrhythmias, sinus tachycardia, or hypertension, particularly in the perioperative period.

Indications

Beta-blockers may be indicated in:

- Hypertension
- Pheochromocytoma (only with an alpha-blocker)
- Angina
- Secondary prevention after ACS
- Arrhythmias including atrial fibrillation
- Heart failure
- Thyrotoxicosis
- Anxiety
- Prophylaxis of migraine
- Essential tremor
- Glaucoma

Contraindications

Beta-blockers are contraindicated in people with:

- A history of asthma or bronchospasm.
- Reversible or severe COPD
- Known intolerance or hypersensitivity to beta-blockers
- Severe or symptomatic bradycardia (heart rate less than 60 beats per minute)
- Sinoatrial block, second- or third-degree heart block (unless there is a pacemaker in place)
- Severe or uncontrolled heart failure
- Severe or symptomatic hypotension (systolic blood pressure less than 90 mmHg)
- Severe peripheral arterial disease (including intermittent claudication) or Raynaud's syndrome
- Sick sinus syndrome
- Cardiogenic shock or phaeochromocytoma (without a concomitant alpha-blocker)
- Frequent episodes of hypoglycaemia

Cautions

Beta-blockers should be used with caution in people with:

- Heart failure with chronic kidney disease (CKD), hypotension, ischaemic heart disease, or less severe peripheral arterial disease
- Prinzmetal's angina
- Current or recent (within 4 weeks) exacerbation of heart failure
- First-degree atrioventricular heart block
- Portal hypertension (risk of deterioration in liver function)
- Diabetes mellitus (affects carbohydrate metabolism and symptoms of hypoglycaemia may be masked)
- COPD
- Myasthenia gravis
- Psoriasis
- Thyrotoxicosis (symptoms may be masked)
- People who wear contact lenses (reduced secretion of lacrimal fluid)
- Chronic kidney disease

Adverse effects

- Deteriorating symptoms of heart failure (such as symptoms of fluid overload and fatigue)
- Hypotension and bradycardia
- Dizziness, headache, and syncope
- Nausea, vomiting, diarrhoea, and constipation
- Sexual dysfunction including erectile dysfunction and loss of libido
- Cold extremities, paraesthesia, and numbness (more common in people with peripheral arterial disease)
- Effect on carbohydrate metabolism (hypo- or hyperglycaemia in people with or without diabetes mellitus)
- Effect on metabolic and autonomic response to hypoglycaemia (possible masking of hypoglycaemia warning signs such as tremor and tachycardia)
- Fatigue and asthenia (lack of energy and strength)
- Sleep disturbance, nightmares, and depression
- Bronchospasm
- Reduction of secretion of lacrimal fluid (may affect people who wear contact lenses)

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 120 of 121

In adult advanced life support, what is the correct initial dose of amiodarone for a shockable rhythm:

a 500 mcg

b 50 mg

c 200 mg

d 300 mg

e 400 mg

< Previous | Next > | See Answer

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 120 of 121

In adult advanced life support, what is the correct initial dose of amiodarone for a shockable rhythm:

a) 500 mcg
b) 50 mg
c) 200 mg
d) **300 mg** ✔
e) 400 mg

Answer

IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Notes

Basic life support

- For chest compressions in adult basic life support the heel of one hand should be placed over the middle of the lower half of the patient's sternum with the other hand on top.
- The sternum should be depressed to a depth of 5 – 6 cm.
- Chest compressions should be performed at a rate of 100 – 120 per minute.
- Thirty compressions should be given before two breaths and that ratio continued (30:2).
- The person giving CPR should be changed every 2 minutes if possible to avoid exhaustion and poor quality chest compressions.
- Interruptions should be minimised (pauses should be < 5 seconds).

Advanced life support

- In adult advanced life support, basic life support should continue whilst the defibrillator pads are attached and the airway managed.
- The pads should be positioned one to the right of the upper sternum below the clavicle and the other in the left midaxillary line in the 5th intercostal space.
- Chest compressions should be paused briefly (< 5 secs) to assess the rhythm and then continued as the defibrillator charges if a shockable rhythm is identified or continued for a further two whole minutes if a non-shockable rhythm is identified.
- When delivering a shock, everybody should be clear of the patient (and any GTN patches and oxygen sources removed).
- Once the shock has been delivered, compressions should resume immediately and continue for a further two minutes before checking the rhythm again or feeling for a pulse.

Shockable rhythm (ventricular fibrillation or pulseless ventricular tachycardia)

- IV adrenaline 1 mg (10 mL of 1:10,000 solution) should be given after 3 shocks and every 3 – 5 minutes/after alternate shocks thereafter.
- IV amiodarone 300 mg should be given after 3 shocks. A further dose of IV amiodarone 150 mg may be considered after a total of five defibrillation attempts. Lidocaine (1 mg kg⁻¹) may be used as an alternative if amiodarone is not available but may not be given if amiodarone has been given already.

Non-shockable rhythm (asystole or pulseless electrical activity)

- IV adrenaline 1 mg should be given as soon as IV access is achieved and then given every 3 – 5 minutes/after alternate shocks thereafter.

< Previous | Next >

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 121 of 121

What is the main mechanism of action of dobutamine as an inotropic sympathomimetic:

a Dopamine receptor agonist

b Beta1-receptor agonist

c Beta2-receptor agonist

d Alpha1-receptor agonist

e Alpha2-receptor agonist

< Previous | See Answer | Submit

Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered

Pharmacology: Cardiovascular

Question 121 of 121

What is the main mechanism of action of dobutamine as an inotropic sympathomimetic:

a) Dopamine receptor agonist
b) **Beta1-receptor agonist** ✔
c) Beta2-receptor agonist
d) Alpha1-receptor agonist
e) Alpha2-receptor agonist

Answer

Dobutamine directly stimulates the beta1-adrenergic receptors in the heart and increases contractility and cardiac output with little effect on the rate. In addition action on beta2-receptors causes vasodilation.

Notes

Shock is a medical emergency associated with a high mortality. The underlying causes of shock such as haemorrhage, sepsis, or myocardial insufficiency should be corrected. The profound hypotension of shock must be treated promptly to prevent tissue hypoxia and organ failure. Volume replacement is essential to correct the hypovolaemia associated with haemorrhage and sepsis but may be detrimental in cardiogenic shock.

Inotropic sympathomimetics

Depending on haemodynamic status, cardiac output may be improved by the use of sympathomimetic inotropes such as adrenaline/epinephrine, dobutamine or dopamine.

In septic shock, when fluid replacement and inotropic support fail to maintain blood pressure, the vasoconstrictor noradrenaline/norepinephrine may be considered. In cardiogenic shock peripheral resistance is frequently high and to raise it further may worsen myocardial performance and exacerbate tissue ischaemia.

- Dobutamine directly stimulates the beta1-adrenergic receptors in the heart and increases contractility and cardiac output with little effect on the rate. In addition action on beta2-receptors causes vasodilation.
- Dopamine is a neurotransmitter and a metabolic precursor of the catecholamines. It acts on beta1-receptors in cardiac muscle increasing cardiac contractility, and increases renal perfusion by stimulating dopamine receptors in the renal vasculature. This is of benefit in cardiogenic shock where deterioration of renal function is common.
- Epinephrine increases blood pressure by stimulating the rate and force of the heartbeat (beta1-effects). Stimulation of vascular alpha-receptors causes vasoconstriction (viscera, skin) but beta-2 receptor stimulation causes vasodilation (skeletal muscle) and the total peripheral resistance may actually decrease.
- Norepinephrine has little or no effect on the vascular beta2-receptors, and so the alpha-mediated vasoconstriction is unopposed. The resulting rise in blood pressure reflexively slows the heart.

The use of sympathomimetic inotropes and vasoconstrictors should preferably be confined to the intensive care setting and undertaken with invasive haemodynamic monitoring.

Vasoconstrictor sympathomimetics

Vasoconstrictor sympathomimetics, such as ephedrine and metaraminol, raise blood pressure transiently by acting on alpha-adrenergic receptors to constrict peripheral vessels. They are sometimes used as an emergency method of elevating blood pressure where other measures have failed. Their use is limited as although they raise the blood pressure they also reduce organ perfusion.

< Previous | Submit | Something wrong?

Question Navigator

1 Answered
2 Answered
3 Answered
4 Answered
5 Answered
6 Answered
7 Answered
8 Answered
9 Answered
10 Answered
11 Answered
12 Answered